123520



# GLENDALE SOUTH OPERABLE UNIT

# RECORD OF DECISION

**PART I: DECLARATION**

**PART II: DECISION SUMMARY**

**PART III: RESPONSIVENESS SUMMARY**

## SAN FERNANDO VALLEY AREA 2 SUPERFUND SITE

## LOS ANGELES COUNTY, CALIFORNIA

United States Environmental Protection Agency
Region 9 - San Francisco, California

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# RECORD OF DECISION

# GLENDALE SOUTH OPERABLE UNIT INTERIM REMEDY

# PART I. DECLARATION

## SITE NAME AND LOCATION

San Fernando Valley Area 2
Glendale South Operable Unit
Los Angeles County, California

## STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Glendale South Operable Unit, San Fernando Valley Area 2 Superfund site, chosen in accordance with CERCLA as amended by SARA and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this operable unit.

In a letter to EPA dated May 28, 1993 the State of California agreed with the selected remedy for the Glendale South OU.

## ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare or the environment.

## DESCRIPTION OF THE REMEDY

EPA has selected an interim remedy for the South plume of groundwater contamination in the Glendale Study Area. This interim remedy is referred to as the Glendale South Operable Unit (OU). An OU is a discrete action that comprises an incremental step toward comprehensively addressing Superfund site problems. The remedy and all of the alternatives presented in the feasibility study were developed to meet the following specific objectives for the Glendale South OU:

- To inhibit vertical and horizontal migration of groundwater contamination in the South Plume of the Glendale Study Area; and
- To begin to remove contaminant mass from the upper zone of the aquifer in the South Plume of the Glendale Study Area.

The remedy involves groundwater extraction and treatment for the shallow aquifer system in the Glendale area of the San Fernando Valley. Under this remedy, contaminated groundwater will be

extracted at a rate of 2,000 gallons per minute (gpm) for 12 years from new wells to be installed in the South Plume of the Glendale Study Area. The extracted contaminated groundwater will be filtered to remove any suspended solids, if necessary, and then treated by air stripping (single or dual-stage) and/or liquid phase granular activated carbon (GAC) to remove volatile organic compounds (VOCs). After treatment, the water shall meet drinking water standards (maximum contaminant levels or MCLs) for VOCs. If air stripping treatment is selected, air emissions will be treated using vapor phase GAC to ensure that all air emissions meet applicable or relevant and appropriate requirements. The exact number, location and other design specifics of these new extraction wells and air stripping/liquid phase GAC units will be determined during the remedial design phase of the project to best meet the objectives of the remedy. After treatment to remove VOCs, the water will be blended as necessary with an alternative water source of a quality such that the treated, blended water would meet all drinking water standards (including the nitrate MCL). All or part of the extracted treated water will then be conveyed to the City of Glendale or another San Fernando Valley water purveyor for distribution through its public water supply system. Groundwater monitoring wells will be installed and sampled regularly to help evaluate the effectiveness of the remedy.

As a result of comments by the City of Glendale on the Glendale North OU Proposed Plan (July 1992) and Glendale South OU Proposed Plan (September 1992) which indicated that the City had sufficient water credits to accept the treated water from both the Glendale North and Glendale South OUs, and in order to decrease overall costs associated with the OUs, EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined at a single location. The total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact configuration of the combined treatment plant will be determined during the remedial design phase of the project. The Glendale North OU Record of Decision will also reflect this decision to combine the treatment plants.

However, if EPA determines that combining the treatment plants will significantly delay or hinder the implementation of the Glendale South OU, the treatment plants will not be combined. Furthermore, if the City of Glendale does not accept any or all of the treated water (possibly due to water supply needs), any remaining portion of water will be: 1) offered to another San Fernando Valley water purveyor or 2) recharged into the aquifer at the Headworks Spreading Grounds.

The total duration of the Glendale South OU interim remedy will be 12 years. EPA will determine the need for and scope of any further actions every five years throughout this interim remedy period and again at the conclusion of this period.

The remedial action for the Glendale South OU represents a discrete element in the overall long-term remediation of

groundwater in the eastern portion of the San Fernando Valley. The objectives of this interim action (i.e. inhibiting vertical and horizontal migration of groundwater contamination and beginning to remove contaminant mass from the upper zone of the aquifer in the South Plume of the Glendale Study Area) would not be inconsistent with nor preclude implementation of any final, overall remedial action or actions selected by EPA in the future for the San Fernando Valley Areas 1, 2, 3 and 4.

EPA is the lead agency for this project and the Department of Toxic Substances Control of the State of California Environmental Protection Agency is the support agency.

DECLARATION

This interim action is protective of human health and the environment, complies with Federal and State applicable or relevant and appropriate requirements directly associated with this action and is cost effective. This action utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, given the limited scope of the action. Because this action does not constitute the final remedy for the site, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element will be addressed at the time of the final response action. Subsequent actions are planned to fully address the principal threats at these sites.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, EPA shall conduct a review, pursuant to CERCLA Section 121, 42 U.S.C. Section 9621, at least once every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

John C. Wise
John C. Wise
Acting Regional Administrator

6.18.93
Date

## PART II. DECISION SUMMARY

This Decision Summary provides an overview of the Glendale South OU interim remedy, including a description of the nature and extent of contamination to be addressed and the remedial alternatives, the comparative analysis of the remedial alternatives, a description of the selected remedy, and the rationale for remedy selection.

### 1.0 SITE LOCATION AND DESCRIPTION

The Glendale Study Area is located within the San Fernando Basin. The following sections present a basin description, regulatory history, and a summary of the Remedial Investigation and Feasibility Study (RI/FS) activities within the San Fernando Valley and the Glendale Study Area.

### 1.1 Description of the San Fernando Basin

The San Fernando Basin is located within the Upper Los Angeles River Area (ULARA), which consists of the entire watershed of the Los Angeles River and its various tributaries. The San Fernando Basin covers approximately 122,800 acres and comprises 91.2 percent of the ULARA alluvial fill. It is bounded on the north and northwest by the Santa Susana Mountains, on the northeast by the San Gabriel Mountains, on the west by the Simi Hills, and on the south by the Santa Monica Mountains.

The San Fernando Basin is a significant source of drinking water, with an estimated total volume of 3 million acre-feet of groundwater stored in aquifers within the alluvial fill of the basin. The groundwater of the San Fernando Basin has been used as a source of drinking water for more than 800,000 residents within the cities of Los Angeles, Burbank, Glendale, and San Fernando. Groundwater extractions within the San Fernando Basin typically provide 15 percent of Los Angeles' annual average water supply and historically have accounted for between 50 and 100 percent of the water needs of the other cities.

### 1.2 Description and Background of the Glendale Study Area

The Glendale Study Area is in the vicinity of the Crystal Springs National Priorities List (NPL) Site, one of the four San Fernando Valley Superfund NPL sites, and is adjacent to the Los Angeles River (Figure 1-1). The Glendale Study Area includes two portions of the aquifer where high concentrations of contaminants have been identified: the North Plume and the South Plume (Figure 1-2). Although contamination has been detected throughout the Glendale Study Area in an apparently contiguous plume, differences exist between the North Plume and South Plume, including the types of contaminants detected and the concentrations of the

contaminants. The Glendale North and South Plumes are separated by an area of groundwater with lower concentrations of contamination. The Glendale South OU includes the South Plume of VOC contamination and adjacent areas where contamination is known or believed to have migrated. The Glendale South OU extends south towards the Pollock Operable Unit. Some of the monitoring wells constructed to help define the extent of the Pollock Ou are located within the Glendale South OU.

In 1990, an analysis was performed to evaluate the need for an OU within the Crystal Springs NPL site (CH2M Hill, 1990). This analysis included a qualitative comparison based on known groundwater contamination, potential downgradient impacts and water supply. This analysis concluded that there was a need for an OU within the Crystal Springs NPL site because of the: 1) high concentrations of TCE and PCE present in groundwater, 2) critical loss of groundwater production in the Glendale area and 3) potential impact of contaminating groundwater downgradient from the Crystal Springs NPL site. Additional data collection was recommended to more adequately characterize the horizontal and vertical distribution of contamination in the aquifer, and also to improve the definition of the hydrogeology of the area.

EPA conducted a remedial investigation (RI) that characterized the nature and extent of contamination in the Glendale Study Area. Upon completion of the Remedial Investigation Report for the Glendale Study Area (January 1992), a feasibility study (FS) was undertaken for the Glendale South OU which evaluated a range of cleanup alternatives for addressing the contaminated groundwater. The FS report entitled Feasibility Study for the Glendale Study Area South Plume Operable Unit was completed in August 1992.

## 2.0 SITE HISTORY

In 1980, after finding organic chemical contamination in the groundwater of the San Gabriel Valley, the California Department of Health Services (DHS) requested that all major water purveyors using groundwater in the San Fernando Valley conduct tests for the presence of certain industrial chemicals in the water they were serving. The results of initial tests and of subsequent testing revealed the presence of volatile organic compound (VOC) contamination in the groundwater of the San Fernando Valley. These findings resulted in a number of municipal supply wells for the cities of Los Angeles, Burbank, and Glendale being taken out of service. The primary contaminants of concern were and are the solvents trichloroethylene (TCE) and perchloroethylene (PCE), which have been widely used in a variety of industries including machinery degreasing, metal plating and dry cleaning.

In 1984, EPA proposed four sites within the San Fernando Valley for inclusion on the NPL and in 1986 the sites were added to

the list (Figure 2-1). Each site encompasses an area in which production wells produced groundwater containing concentrations of TCE and PCE above State and Federal standards in 1984. The four NPL sites in the San Fernando Valley are the North Hollywood, Crystal Springs, Verdugo, and Pollock sites, also referred to as San Fernando Valley Areas 1, 2, 3, and 4, respectively. The EPA has now shifted from defining the sites based on production wells to managing it as one large site defined by the extent of the contaminated plume of groundwater. The San Fernando Valley Study Area includes the four sites as listed on the NPL and adjacent areas where contamination has or may have migrated. A basinwide groundwater RI report for the San Fernando Valley Study Area was completed in December 1992. Groundwater wells installed by EPA as part of the basinwide groundwater RI are routinely sampled to continue to monitor the nature and extent of the groundwater contamination in the San Fernando Valley. In addition, monitoring well data gathered at individual facilities in the San Fernando are included in the EPA database which is used to generate plume maps of the basin.

EPA has previously signed Record of Decision (ROD) documents for two OUs in the San Fernando Valley: the North Hollywood OU (1987) and the Burbank OU (1989). The North Hollywood OU interim remedy is currently operating and the Burbank OU is in the remedial design phase. In the Glendale Study Area, EPA has identified two OUs: the Glendale North Plume OU and the Glendale South Plume OU. In addition, EPA has recently initiated an RI/FS for an OU in the Pollock area of the San Fernando Valley. All of these OUs represent interim cleanups currently in progress throughout the eastern portion of the San Fernando Valley. All remedial actions established by EPA thus far in the ROD for each OU have been interim measures. EPA has not yet selected a final remedy for the entire San Fernando Valley.

The most prevalent groundwater contaminants in the Glendale Study area are TCE and PCE. In 1992, the highest concentrations of TCE and PCE detected in EPA monitoring wells in the San Fernando Valley were 7100 ppb and 160 ppb, respectively. Groundwater samples from wells installed at industrial facilities in the San Fernando Valley near potential sources of contamination have shown concentrations greater than 30,000 ppb for TCE and over 15,000 ppb for PCE. The maximum levels of 820 ppb of TCE and 220 ppb of PCE were detected in shallow wells located in the south plume portion of the Glendale Study Area. The MCL for both TCE and PCE is 5 ppb.

Nitrate, an inorganic contaminant, has been detected consistently at levels in excess of the MCL (45 milligrams per liter (mg/l), also referred to as parts per million (ppm) as nitrate, or 10 mg/l nitrate as nitrogen) in the groundwater of the Glendale Study Area. The nitrate contamination is likely to be the result of past agricultural practices and/or septic systems in the San Fernando Valley.

# SAN FERNANDO VALLEY SUPERFUND SITE

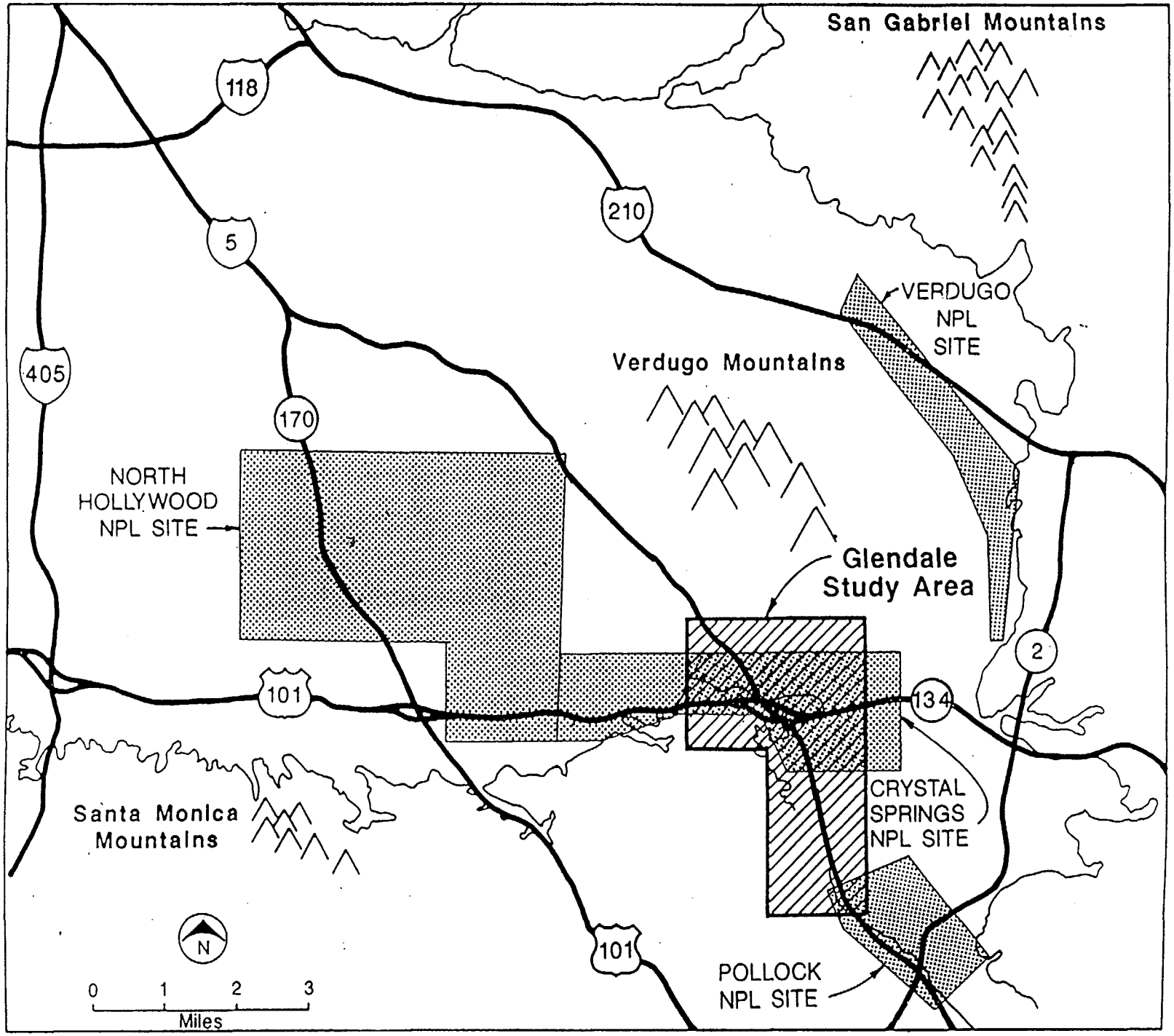



FIGURE 1-1

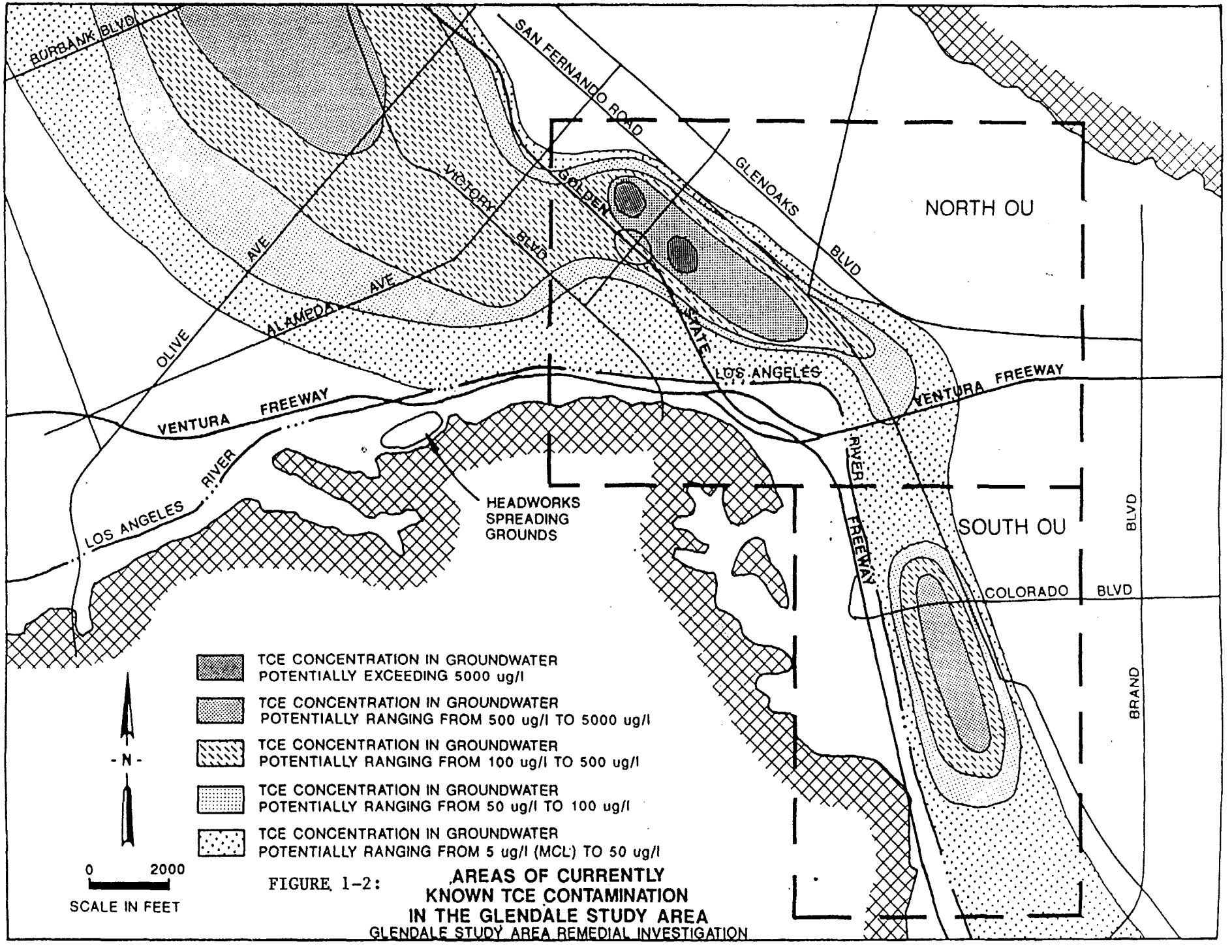
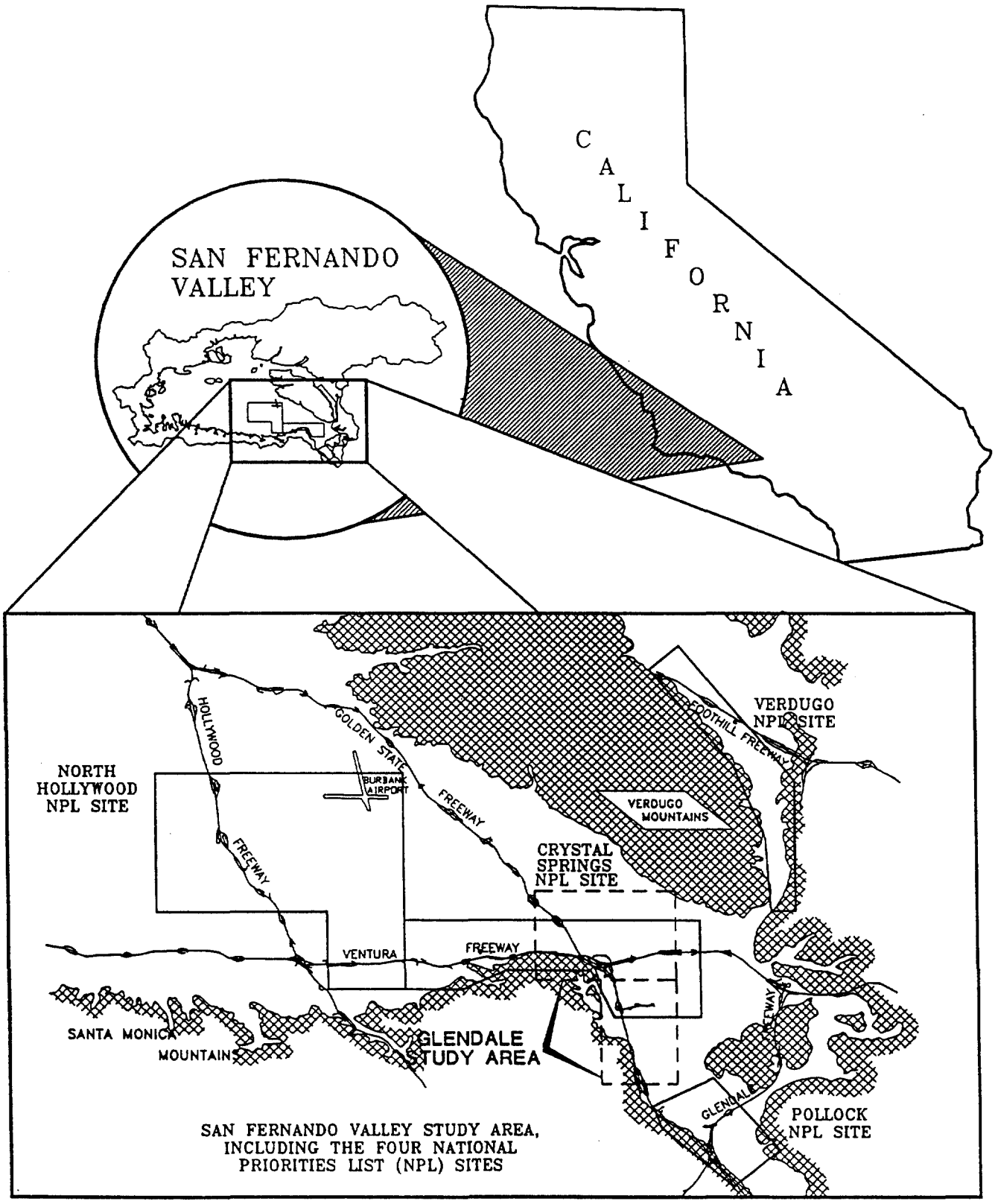



FIGURE 1-2: **AREAS OF CURRENTLY KNOWN TCE CONTAMINATION IN THE GLENDALE STUDY AREA**

GLENDALE STUDY AREA REMEDIAL INVESTIGATION




GLENDALE STUDY AREA

FIGURE 2-1
SITE LOCATION MAP

It should be noted that the Cities of Glendale and Los Angeles closely monitor the quality of drinking water delivered to residents. The water served to residents must meet all Federal and state drinking water requirements. Currently, nearly all of the water delivered by the City of Glendale is purchased from the Metropolitan Water District (MWD) of Southern California. The City uses a limited amount of groundwater from a small percentage of its nine production wells in the San Fernando Valley. If the levels of VOCs and other contaminants detected in the groundwater of production wells are equal to or less than 10 times MCLs, the State of California Department of Health Services, Office of Drinking Water permits the City to extract the water, blend it with MWD water to meet all drinking water standards, and convey the extracted, blended water to its public distribution system.

As described briefly in Section 1 above, the Glendale Study Area includes two portions of the aquifer where high concentrations of contaminants have been identified: the north plume and the south plume. A remedial investigation (RI) that characterized the nature and extent of contamination in the Glendale Study Area was completed in (January 1992). The Glendale Study Area RI included a characterization of the nature and extent of contamination, baseline risk assessments, and other RI data for both the north and south plumes. However, separate FS reports evaluating a range of cleanup alternatives for the contaminated groundwater were prepared for each plume. The Glendale South OU FS report and subsequent Proposed Plan were finalized in August 1992 and September 1992, respectively. The Glendale North OU FS report was completed in April 1992 and the Proposed Plan was completed in June 1992.

EPA's preferred alternatives as described in the Proposed Plans were: extraction of 3000 gallons per minute (gpm) of contaminated groundwater for Glendale North and 2000 gpm for Glendale South, treatment of VOCs by air stripping or liquid phase GAC, and conveyance of the treated water to a water purveyor, where it would be blended with water of a quality such that the treated, blended water would meet all drinking water standards, for eventual distribution through a public water system. As a contingency, if all or part of the treated water was not accepted by the purveyors (possibly due to water supply needs), the treated water from Glendale North would be reinjected and for Glendale South would be recharged at the Headworks Spreading Grounds (see Figure 1-2).

In response to comments by the City of Glendale on the Glendale North and South OU Proposed Plans and in order to decrease overall costs associated with the OUs, EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined at one location and the total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact configuration of the combined treatment plant will be determined during the remedial

design phase of the project. The Glendale North OU Record of Decision also reflects this decision to combine the treatment plants.

However, if EPA determines that combining the treatment plants will significantly delay or hinder the implementation of the Glendale South OU, the treatment plants will not be combined. Furthermore, if the City of Glendale does not accept any or all of the treated water (possibly due to water supply needs), any remaining portion of water will be 1) offered to another San Fernando Valley water purveyor or 2) recharged into the aquifer at the Headworks Spreading Grounds.

## 3.0 ENFORCEMENT ACTIVITIES

In September 1989, EPA signed a cooperative agreement with the State Water Resources Control Board (SWRCB) providing funds for the Regional Water Quality Control Board, Los Angeles Region (RWQCB) to expand its capability to conduct source reduction, identification, and enforcement activities at individual facilities in the San Fernando Valley. Activities include conducting surveys and inspections, and overseeing investigations and remedial activities. The cooperative agreement has been renewed annually since 1989. If RWQCB investigations confirm soil or groundwater contamination at a specific facility, then that facility is referred to EPA. EPA is using the RWQCB's facility-specific information in conjunction with RI data, groundwater and vadose zone modeling results and information gathered from other sources including California Environmental Protection Agency (CAL-EPA) investigations, South Coast Air Quality Management District (SCAQMD) investigations and responses to information request letters, to build enforcement cases.

EPA is and will be using its investigatory resources, enforcement resources and authority under CERCLA in conjunction with the work of the RWQCB to:

- Identify individuals and companies who are responsible for the historic and current contamination.
- Compel responsible parties to design, construct and operate treatment facilities and reimburse EPA for prior and any future expenditures at the site.

EPA has issued preliminary notices of potential liability (General Notice) for the Glendale South OU to nineteen parties to date. These parties have been preliminarily identified as owners and operators of twelve facilities located in the vicinity of the South Plume of the Glendale Study area of the San Fernando Valley. EPA anticipates that additional parties will be notified of potential liability. Special notice pursuant to CERCLA §122 has not yet been issued for the Glendale South OU.

## 4.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

EPA's preferred alternative, as well as five other alternatives were described in EPA's Proposed Plan for the Glendale South OU (September 1992). The Proposed Plan was in the form of a fact sheet and was distributed to all parties on EPA's mailing list for the San Fernando Valley Superfund sites. The original 30 day public comment period was extended several times for a total comment period of 15 weeks (107 days) after EPA received requests for extensions from members of the public. The public comment period closed on January 19, 1993. EPA received over 250 comments. These comments and EPA's responses to these comments are summarized in Part III (the Responsiveness Summary) of this ROD.

A public meeting was held in the City of Glendale on October 21, 1992, to discuss EPA's preferred alternative and the other alternatives. At this meeting EPA gave a brief presentation regarding the Proposed Plan, answered questions, and accepted comments from members of the public.

During the public comment periods for the Glendale North and Glendale South OUs, the City of Glendale provided comments emphasizing that it would like to receive more than the 3,000 gpm of extracted, treated groundwater proposed under the Glendale North Proposed Plan. The City also indicated that it had stored water credits and water rights sufficient to accept greater than 5,000 gpm of extracted, treated groundwater from the San Fernando Valley. As a result of the City's comments on the Glendale North and Glendale South OUs, and after evaluating the relative total cost of a combined plant versus separate plants, EPA has determined that the treatment plants for the Glendale North and South OUs will be combined and the total 5,000 gpm of treated water will be conveyed to the City of Glendale.

A press release to announce the release of the Proposed Plan was issued October 1, 1992. Notice of the public meeting as well as the availability of the Proposed Plan was published in the Los Angeles Daily News on November 4, 1992. An announcement of the extension of the public comment period was published in the Los Angeles Daily News on December 3, 1992. In addition, two newspaper articles were written about the remedial investigation, the feasibility study and the Proposed Plan for the Glendale South OU including: Los Angeles Times - October 8, 1992 and Los Angeles Daily News - October 22, 1992. A map of the Glendale South OU was provided in the Proposed Plan and the various newspaper articles described the area that would be impacted by the Glendale South OU.

In general, the purpose of EPA's community relations program for the San Fernando Valley project is to inform community members and other interested parties about the Federal activities to address contamination at the hazardous waste sites, as well as to encourage two way communication between the concerned public and

EPA and/or other local agencies.

From March 1987 through December 1991, EPA and LADWP attended quarterly meetings of the Community Work Group (CWG) to discuss technical issues and management strategies involving the San Fernando Valley Superfund project including the interim groundwater cleanup for the Glendale area. The CWG consisted of interested San Fernando Valley community residents, elected officials, agency representatives, and environmental and business leaders. The CWG provided input to EPA on the various components of the Superfund project, including the interim groundwater cleanup of the Glendale area.

The community relations plan for the San Fernando Valley Superfund sites was most recently updated and issued in April 1990. The plan will be revised again in 1993 to address community relations during the remedial design phase of the Glendale South OU interim action, and to document other changes in the community relations program.

## 5.0 SCOPE AND ROLE OF THE OPERABLE UNIT

The interim remedial action for the Glendale South OU represents a discrete element in the overall long-term remediation of groundwater in the eastern portion of the San Fernando Valley. While the final overall plan for the remediation of the San Fernando Valley Sites has not yet been determined, the objectives of the Glendale South OU are:

- To inhibit vertical and horizontal migration of groundwater contamination in the South Plume of the Glendale Study Area
- To begin to remove contaminant mass from the upper zone of the aquifer in the South Plume of the Glendale Study Area.

EPA does not expect these objectives to be inconsistent with, nor preclude, any final action for San Fernando Valley Areas 1, 2, 3 and 4.

The Glendale South OU interim remedy is intended to address the immediate and significant groundwater contamination problem in and beyond a portion of San Fernando Valley Area 2 (also known as the Crystal Springs NPL Site, see Figure 1-1). A more complete investigation of the overall groundwater problem in the San Fernando Valley is being conducted through the basinwide remedial investigation and feasibility study process.

The basinwide groundwater RI Report for the San Fernando Valley Study Area was completed in December 1992. Groundwater wells installed by EPA as part of the basinwide RI are routinely

sampled to continue to monitor the nature and extent of the groundwater contamination in the San Fernando Valley.

EPA is currently using the results of the remedial investigation in basinwide feasibility studies to address VOC contamination in both the groundwater and vadose zone of the eastern portion of the San Fernando Valley.

As part of the basinwide groundwater FS, EPA is revising and recalibrating the basinwide groundwater flow model to incorporate the most recent data. The updated version of the model will be complete in 1993. EPA will then review and evaluate various groundwater remediation options for the basin including: regional pump and treat, well-head treatment, use of innovative technologies and no-further-action alternatives.

EPA has also initiated work on a vadose zone FS to examine ways to protect the groundwater from contaminants that could reach the groundwater in the future. This FS will review and evaluate options for cleanup of VOC contamination in the vadose zone of the San Fernando Valley.

EPA will continue to gather and analyze information important to the project. EPA has been working with the San Fernando Valley water purveyors and the Upper Los Angeles River Area (ULARA) Watermaster to summarize past and future groundwater management in the San Fernando Valley, including an overall water balance for the San Fernando Valley. EPA's interim actions to remove contaminants and inhibit migration from the most contaminated areas in North Hollywood, Burbank, Glendale North, Glendale South and Pollock OUs will also provide information useful for the basinwide FS.

## 6.0 SUMMARY OF GLENDALE SOUTH OU SITE CHARACTERISTICS

Results of LADWP's groundwater monitoring programs conducted from 1981 through 1987 revealed that TCE and PCE had contaminated approximately 50 percent of the water supply wells in the eastern portion of the San Fernando Valley groundwater basin at concentrations exceeding State and Federal drinking water standards.

The results of recent (1989-1992) EPA sampling of groundwater monitoring wells installed by EPA throughout the San Fernando Valley indicate that TCE and PCE continue to be the principal contaminants of concern. TCE and PCE are industrial solvents commonly used in the metal degreasing and dry-cleaning industries. Both are known animal carcinogens and probable human carcinogens. The Federal MCL for both TCE and PCE is 5 ug/l (ppb). The State MCLs for TCE and PCE are also 5 ug/l (ppb).

There are seven EPA monitoring wells located in the south plume portion of the Glendale Study Area (vertical profile borings

and cluster wells). These wells are: PO-VPB-01, PO-VPB-02, PO-VPB-10, PO-C01-195, PO-C01-354, PO-C02-052, and PO-C02-205. Wells PO-VPB-01, PO-VPB-02 and PO-VPB-10 were sampled initially during November 1989 and PO-VPB-01 and PO-VPB-10 were resampled during August and September 1990. The cluster wells PO-C01 and PO-C02 and were sampled initially in September 1990, at the same time PO-VPB-02 was resampled. The following discussion summarizes the results of chemical analyses on the sampling events in August and September 1990.

In the four Upper Zone wells (the three PO-VPBs and PO-C02-052), six VOCs were detected above Federal and/or State MCLs: carbon tetrachloride; 1,2-Dichloroethane (1,2-DCA); 1,1-dichloroethene (1,1-DCE); 1,1,2,2-tetrachloroethane; PCE; and TCE (see Table 6-1). As reported in the FS Report for the Glendale South OU, TCE was detected in three of the four Upper Zone wells in the south plume at a maximum concentration of 820 ppb. PCE was also detected in three of the four Upper Zone wells at a maximum concentration of 140 ppb (see Table 6-1, Figure 6-1 and Figure 6-2).

In the three Lower Zone wells (PO-C01-195, PO-C01-354 and PO-C02-205), the only VOC detected was TCE at a maximum concentration of 4 ppb.

Monitoring wells have been installed at industry facilities in the Glendale south plume portion of the Glendale Study Area. These include three wells at the A.G. Layne facility, seventeen wells at the Philips Components facility and nine wells at the former Franciscan Ceramics facility. All of these wells are screened in shallow groundwater and are discussed as Upper Zone wells.

Nine VOCs (benzene, toluene, total xylenes, 1,1-DCA, 1,1-DCE, 1,1,1-TCA, methylene chloride, PCE and TCE were detected above MCLs at the A.G. Layne facility wells based on samples collected in July 1990. Samples collected in August 1990 at the Philips Components wells show PCE, TCE, methylene chloride and vinyl chloride above MCLs.

Four base, neutral, and acid extractable semi-volatile organic compounds (BNAs), 2-methylnaphthalene, naphthalene, 2,4-dimethylphenol, and 2-methylphenol, were detected in the A.G. Layne wells. Two BNAs, bis(2-ethylhexyl)phthalate and di-n-octylphthalate, were detected in one of the Lower Zone EPA wells (none in Upper Zone sampling). No State or Federal MCLs have been promulgated for these compounds. No chlorinated pesticides or PCBs were detected in the Upper or Lower Zones.

Nitrate has been detected at levels in excess of the MCL in the some of the groundwater samples collected in the South Plume of the Glendale Study Area (see Table 6-1, and Figure 6-3). Nitrate was detected in all of the VPB and cluster wells at concentrations ranging from 9.55 to 16.1 mg/l (as nitrogen). The Federal MCL is

TABLE 6-1

SUMMARY OF ALL DETECTED CONSTITUENTS IN THE UPPER ZONE RI WELLS
FOR THE SOUTH PLUME OU
(Page 1 of 2)

| Constituent | MCL[a] | Minimum Concentration | Maximum Concentration | Number of Wells With Detects out of 4[d] |
|---|---|---|---|---|
| **Volatile Organic Compounds (µg/l)** | | | | |
| Carbon Tetrachloride | 0.5 | -- | 1 | 1 |
| Chloroform | 100[c] | -- | 1 | 1 |
| 1,1-Dichloroethane | 5.0 | -- | 1 | 1 |
| 1,2-Dichloroethane | 0.5 | 3 | 5 | 2 |
| 1,1-Dichloroethene | 6.0 | -- | 41 | 1 |
| 1,1,2,2-Tetrachloroethane | 1.0 | -- | 9 | 1 |
| Tetrachloroethene (PCE) | 5.0 | 3 | 140 | 3 |
| 1,1,1-Trichloroethane (TCA) | 200 | -- | 11 | 1 |
| Trichloroethene (TCE) | 5.0 | 23 | 820 | 3 |
| **Semivolatile Organics (µg/l)** | | | | |
| 2-Methylnaphthalene | --[b] | -- | 110 | 1 |
| Naphthalene | --[b] | -- | 160 | 1 |
| 2,4-Dimethylphenol | --[b] | -- | 16 | 1 |
| 2-Methylphenol | --[b] | -- | 16 | 1 |
| **Priority Pollutant Metals (mg/l)** | | | | |
| Arsenic | 0.05 | -- | 0.005 | 1 |
| Chromium | 0.05 | -- | 1.2 | 1 |
| Mercury | 0.002 | -- | 0.0004 | 1 |
| Nickel | --[b] | -- | 0.06 | 1 |
| Selenium | 0.05 | -- | 0.007 | 1 |
| Silver | 0.05 | -- | 0.005 | 1 |
| Zinc | --[b] | 0.03 | 0.051 | 4 |
| **Inorganic Compounds (mg/l)** | | | | |
| Nitrate (as N) | 10 | 9.55 | 16.1 | 4 |
| Total Dissolved Solids (TDS) By Addition | 500 | 458 | 693 | 4 |

TABLE 6-1

SUMMARY OF ALL DETECTED CONSTITUENTS IN THE UPPER ZONE RI WELLS
FOR THE SOUTH PLUME OU
(Page 2 of 2)

| Constituent | MCL[a] | Minimum Concentration | Maximum Concentration | Number of Wells With Detects out of 4[d] |
|---|---|---|---|---|
| **Radionuclides (pCi/l)** | | | | |
| Gross Alpha | 15 | 2.2 ± 2.5 | 4.5 ± 4.8 | 4 |
| Gross Beta | 50 | 5.0 ± 2.0 | 8.2 ± 1.7 | 4 |
| Radon | --[b] | 66 ± 4.1 | 480 ± 5.4 | 4 |

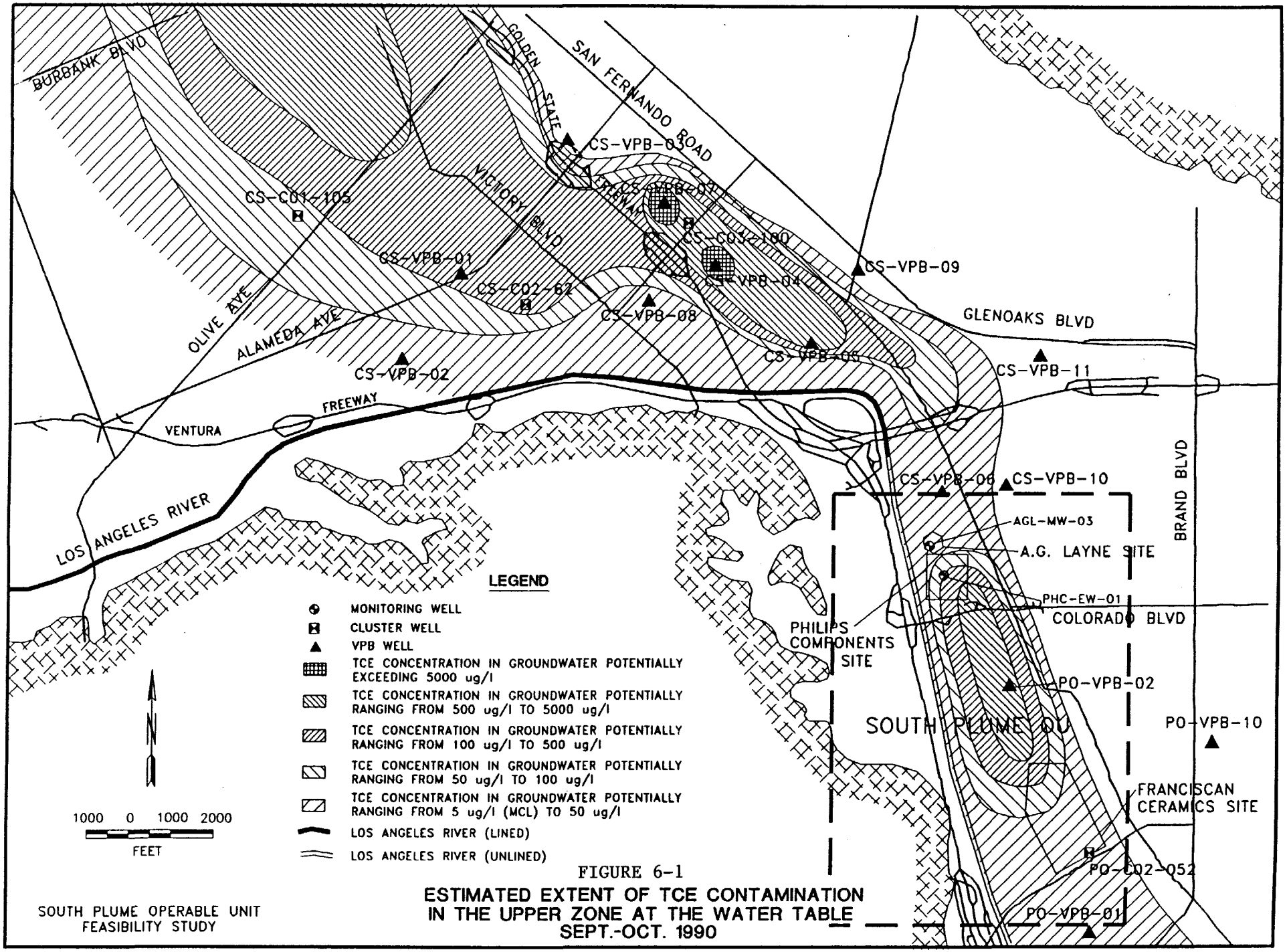
Note: Samples collected August and September 1990.

[a] Promulgated federal or state MCL, whichever is more stringent.

[b] No state or federal MCL promulgated.

[c] MCL is for the sum of trihalomethanes.

[d] The shallow wells include PO-VPB-01, PO-VPB-02, PO-VPB-10, and PO-C02-52.




SPOUPLUM FIG12-3 REV. 08/08/92

SOUTH PLUME OPERABLE UNIT
FEASIBILITY STUDY

FIGURE 6-1

ESTIMATED EXTENT OF TCE CONTAMINATION
IN THE UPPER ZONE AT THE WATER TABLE
SEPT.-OCT. 1990

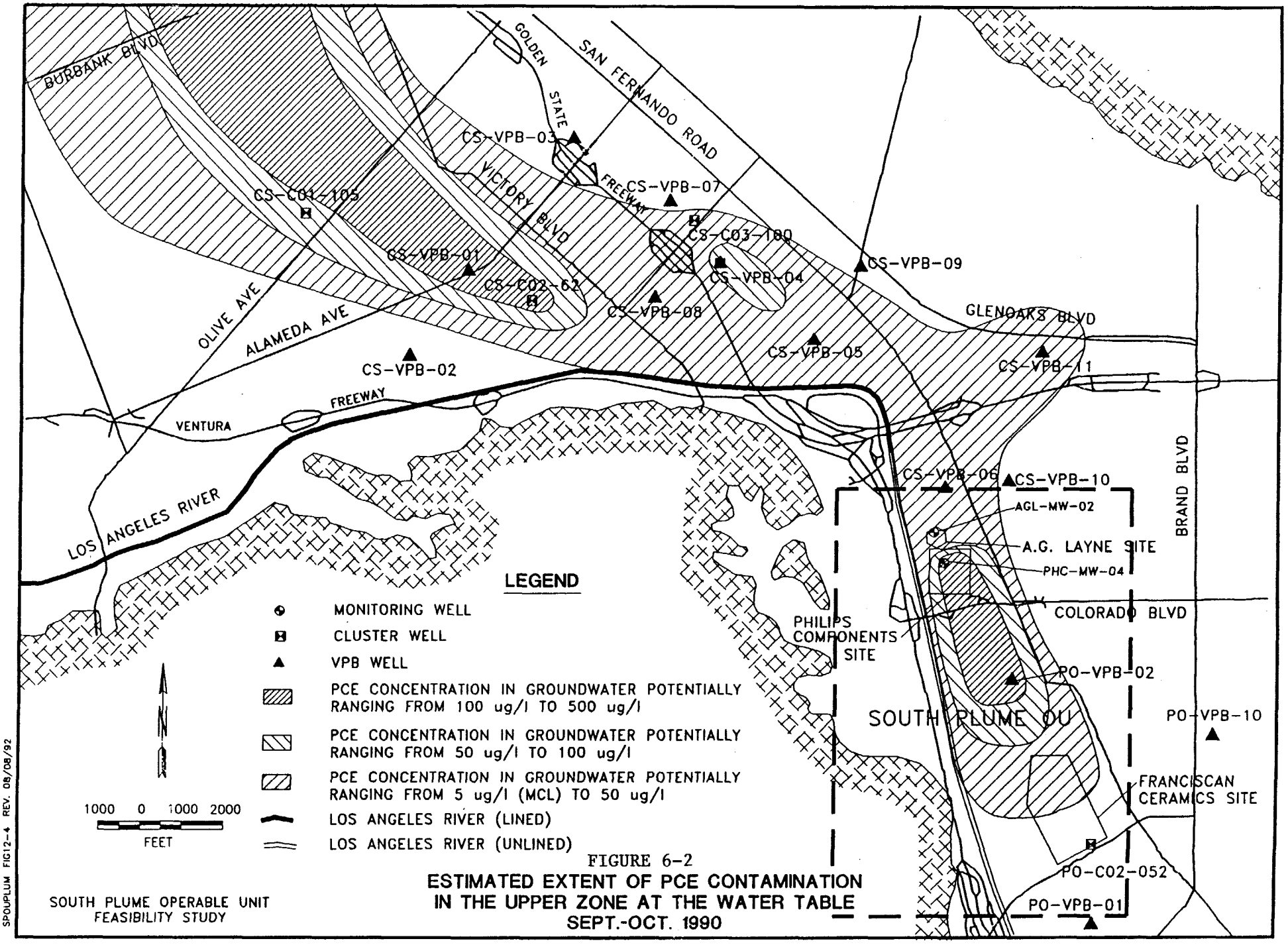



FIGURE 6-2

**ESTIMATED EXTENT OF PCE CONTAMINATION IN THE UPPER ZONE AT THE WATER TABLE SEPT.-OCT. 1990**

SOUTH PLUME OPERABLE UNIT FEASIBILITY STUDY

SPOUPLUM FIG12-4 REV. 08/08/92

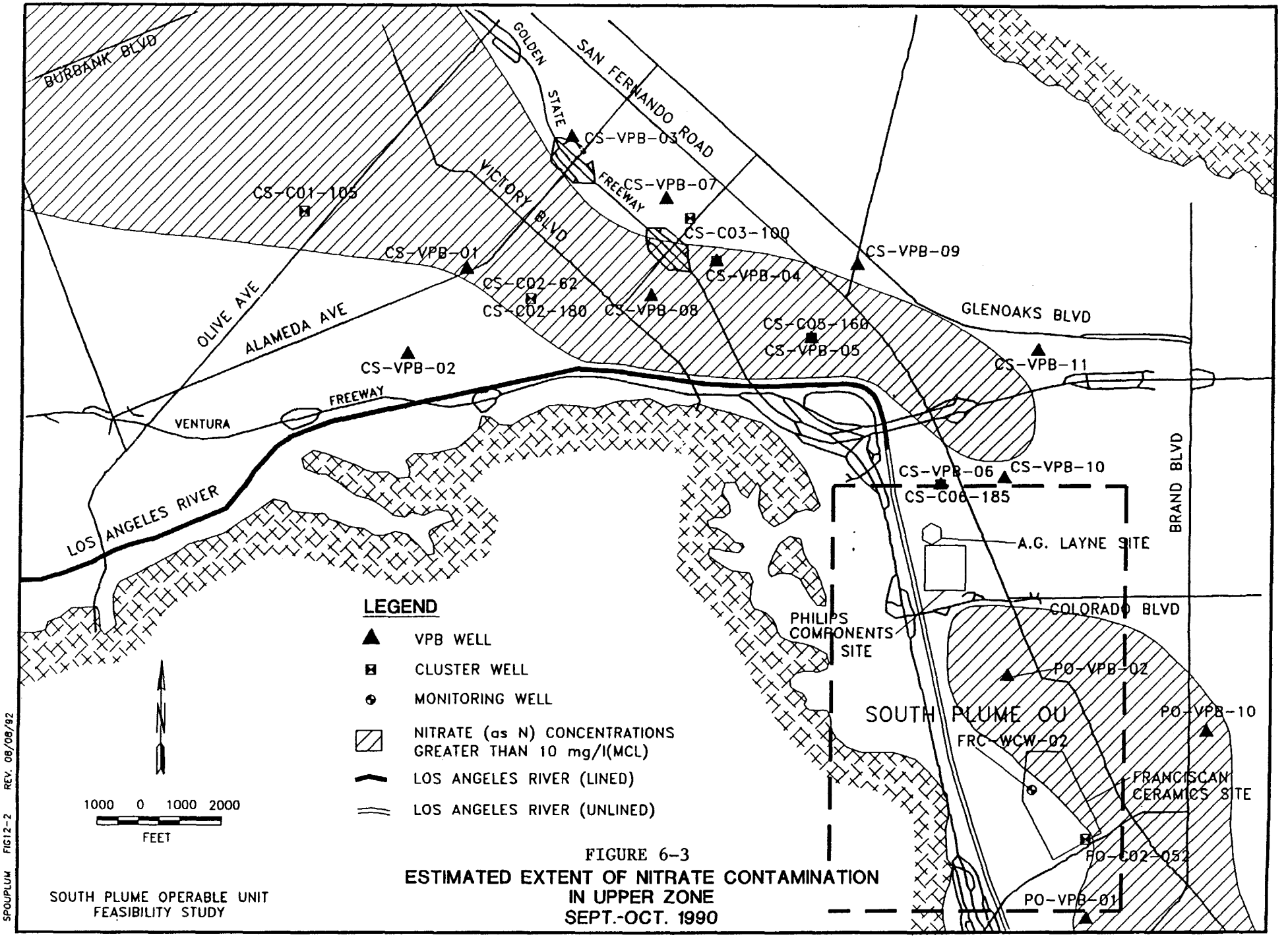



FIGURE 6-3
ESTIMATED EXTENT OF NITRATE CONTAMINATION
IN UPPER ZONE
SEPT.-OCT. 1990

SOUTH PLUME OPERABLE UNIT
FEASIBILITY STUDY

SPOUPLUM FIG12-2 REV. 08/08/92

10 mg/l for nitrate as nitrogen. Nitrate concentrations did not exceed MCLs in any of the Lower Zone wells. The nitrate contamination is likely the result of past agricultural practices and/or septic systems in the San Fernando Valley. Nitrate is not a CERCLA hazardous substance. However, the interim OU remedies in the San Fernando Valley involve the distribution of treated water to public water supply systems and therefore, EPA has been compelled to address the nitrate contamination in developing remedial alternatives.

From the sampling and analyses of the EPA wells, only one metal (chromium) has been detected above the MCL (when field filtering of samples occurred). No metals were detected in the Lower Zone above the MCL. An analysis of these data was performed by EPA's contractor to examine the likelihood that chromium was a waterborne contaminant rather than a sampling artifact (i.e., residual particulates from well construction and development) was presented in a technical memorandum entitled: Review of Metals Data from Monitoring Wells located in the Glendale Study Area, North Operable Unit (June 16, 1992). This memorandum, available for review in the administrative record for the Glendale South OU, concluded that the metal exceedances were most likely the result of sampling artifacts. EPA has continued to analyze groundwater samples collected under the quarterly monitoring program for priority pollutant metals. In a technical memorandum dated May 17, 1993 (available for review in the administrative record for Glendale South), recent sampling of monitoring wells for metals is summarized. Within the Glendale South OU, one well had chromium levels above MCLs; total chromium was reported as high as 733 ppb and hexavalent (dissolved) chromium as high as 182 ppb. This well likely represents contamination from a local source that would not impact extraction wells. However, if necessary, the extracted groundwater will be treated for chromium if this contaminant exceeds drinking water standard.

Thirty-one wells in the Glendale Study Area were sampled for naturally-occurring radionuclides as part of EPA's quarterly monitoring program. The samples were taken during the period of July 31 to August 7, 1992. The results of this third quarter 1992 groundwater sampling for radionuclides indicate that all EPA groundwater monitoring wells in the Glendale Study Area are in compliance with current MCLs for radionuclides (gross alpha, gross beta, gross radium, radium-226, strontium-89, strontium-90, gross uranium, tritium, and radon). In addition, the samples were also in compliance with all proposed radionuclide MCLs, except radon. The proposed MCL for Radon is 300 pCi/l. Most of the groundwater samples from the 31 monitoring wells exceeded the proposed MCL for radon. If necessary, this factor will be taken into account for remedial design. Radionuclides in the groundwater of the Glendale Study Area are discussed in greater detail in: Technical Memorandum San Fernando Valley Superfund Site, Radionuclides in the Glendale Study Area, dated March 2, 1993. This memorandum is

available for review in EPA's Administrative Record for the Glendale South OU.

In addition, analysis of hydrogeology and groundwater modeling conducted during the RI for the Glendale Study Area showed that the groundwater in the area is a source of recharge for the Los Angeles River.

## 7.0 SUMMARY OF SITE RISKS

Data regarding contaminants in the south plume of groundwater contamination in the Glendale Study Area obtained by EPA during the remedial investigation were used to estimate the health risks associated with exposure to the groundwater. This estimate, called a risk assessment, was then used to identify which contaminants pose risks to human health. The data used for the Glendale South OU risk assessment are presented in the Remedial Investigation Report for the Glendale Study Area (January 1992) and in other documents included in the Glendale South OU Administrative Record.

Baseline risk assessments are conducted at Superfund sites to fulfill one of the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The NCP (40 CFR Part 300) requires development of a baseline risk assessment at sites listed on the National Priorities List (NPL) under CERCLA. The CERCLA process for baseline risk assessments is intended to address both human health and the environment. However, due to the highly urbanized setting of the Glendale Study Area, the focus of the baseline risk assessment for the Glendale South OU was on human health issues, rather than environmental issues.

The objective of the baseline risk assessment for the Glendale South OU was to evaluate the human health and environmental risks posed by the contaminated groundwater beneath the south plume portion of the Glendale Study Area if it were to be used as a source of drinking water without treatment. The baseline risk assessment incorporated the water quality information generated during the basinwide groundwater RI field investigation and sampling program to estimate current and future human health and environmental risks. The groundwater data used for the Glendale South OU risk assessment included the water quality information from the PO-VPB wells (with the exception of PO-VPB-10 which is outside the plume area), cluster wells, Philips Components wells, Franciscan Ceramics wells, and A.G. Layne wells.

The risk assessment for the Glendale South OU was conducted in accordance with EPA guidance including: Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (USEPA, 1988), Risk Assessment Guidance for Superfund, Vol. I Health Evaluation Manual (Part A) and Vol. 2 Ecological Assessment (USEPA, 1989), The Exposure Factors Handbook (USEPA, 1989), and Risk Assessment Guidance for Superfund Human Health Risk Assessment,

USEPA Region IX Recommendations (USEPA, 1989).

A risk assessment involves the qualitative or quantitative characterization of potential health effects of specific chemicals on individuals or populations. The risk assessment process comprises four basic steps: 1) hazard identification, 2) dose-response assessment, 3) exposure assessment, and 4) risk characterization. The purpose of each element is as follows:

- Hazard identification characterizes the potential threat to human health and the environment posed by the detected constituents.

- Dose response assessment critically examines the toxicological data used to determine the relationship between the experimentally administered animal dose and the predicted response (e.g., cancer incidence) in a receptor.

- Exposure assessment estimates the magnitude, frequency, and duration of human exposures to chemicals.

- Risk characterization estimates the incidence of or potential for an adverse health or environmental effect under the conditions of exposure defined in the exposure assessment.

Human Health Risk Assessment

Risk assessments estimate the possibility that one additional occurrence of cancer will result from exposure to contamination. A risk of 1 in 1,000,000 (one million) means that one person in one million exposed could develop cancer as a result of the exposure. EPA considers risks greater than one in ten thousand ($10^{-4}$) "unacceptable."

In preparing risk assessments, EPA uses very conservative assumptions that weigh in favor of protecting public health. For example, EPA may assume that individuals consume two liters of drinking water per day from wells situated within a contaminant plume, over a 70-year lifetime or that a person is exposed to a chemical, 24 hours a day, 365 days a year, for a 30-year period, even though typical exposure to the chemical would be less.

The baseline risk assessment for the Glendale South OU is presented in Section 8.0 of the Remedial Investigation Report for the Glendale Study Area (January 1992). The risk assessment estimated the potential risks to public health under current situations and potential future situations. The risk assessment examined the potential health effects if individuals were exposed to contaminated groundwater from the upper and lower zones of the

aquifer of the Glendale South plume groundwater contamination in the Glendale Study Area. Although no production wellfields are located in the area encompassed by the South Plume OU, the potential exists for use of this groundwater as a source of drinking water in the future.

Chemicals of potential concern for the Glendale South OU used in the risk assessment calculations included: TCE; PCE; carbon tetrachloride; 1,1-DCA; 1,2-DCA; 1,1-DCE; nitrate and others including the metals arsenic and chromium. A list of all potential compounds of concern for both the upper and lower aquifer zones included in the quantitative risk assessment for the Glendale South OU are presented in Table 7-1. Due to the potential for adverse health effects to infants from consumption of water with high nitrate levels, a quantitative evaluation of this compound for chronic non-carcinogenic risks was calculated.

As indicated by the table, fewer compounds of potential concern were identified in samples from wells installed in the deep aquifer. Therefore, a separate characterization of risk was performed for the upper and lower groundwater zones.

Table 7-2 lists the wells in the Upper and Lower Zones that were incorporated in the risk assessment. The concentrations of contaminants in these wells used in the risk assessment are from the August and September 1990 sampling for EPA wells (PO-VPBs and PO-Cluster wells), from July 1990 sampling at A.G. Layne wells (AGLs), from August 1990 sampling at Phillips Components wells (PHCs), and March 1989 sampling at the Franciscan Ceramic wells (FRCs). A compound was totally excluded if it was not detected in any of these wells. Half of the detection limit was used if a compound was not detected in a particular well.

An exposure assessment was conducted to identify potential transport pathways (e.g., groundwater, surface water, air); routes of exposures (e.g., ingestion, inhalation, dermal contact); and potential on-site and off-site receptor populations. Exposure assessment involves the consideration of particular transport pathways and routes of exposure to potential receptors which may include current users of the site as well as adjacent populations that may be exposed to chemicals that have been transported off site. Receptors may also include aquatic and terrestrial biota.

A critical step in assessing the potential risk to public health is to identify the pathways through which exposure could occur. The major transport pathway considered in the Glendale South OU baseline risk assessment was the use of contaminated groundwater. The point of potential contact with the contaminated groundwater is through water use from the upper or lower zone.

EPA evaluated two potential methods of exposure to water from the upper and lower zones of the aquifer: (1) exposure during

## TABLE 7-1

## COMPOUNDS OF POTENTIAL CONCERN INCLUDED IN THE QUANTITATIVE RISK ASSESSMENT FOR THE GLENDALE SOUTH PLUME OU

| Constituent | Upper Zone (YES/NO) | Lower Zone (YES/NO) |
|---|---|---|
| **VOCs** | | |
| Benzene | Y | N |
| Carbon Tetrachloride | Y | N |
| 1,1-Dichloroethane | Y | N |
| 1,2-Dichloroethane | Y | N |
| 1,1-Dichloroethene | Y | N |
| Ethylbenzene | N | N |
| Methylene Chloride | Y | N |
| 1,1,2,2-Tetrachloroethane | Y | N |
| Tetrachloroethene | Y | N |
| Toluene | Y | N |
| 1,1,1-Trichloroethane | Y | N |
| Trichloroethene | Y | Y |
| Vinyl Chloride | Y | N |
| Xylene, Total | Y | N |
| **BNAs** | | |
| Bis(2-ethylhexyl)phthalate | N | Y |
| Di-n-octylphthalate | N | Y |
| 2-Methylnaphthalene | Y | N |
| Naphthalene | Y | N |
| **Priority Pollutant Metals** | | |
| Arsenic | Y | N |
| Chromium | Y | N |
| **Inorganics** | | |
| Nitrate | Y | Y |

TABLE 7-2

SUMMARY OF MONITORING WELLS USED
IN THE BASELINE RISK ASSESSMENT
FOR THE GLENDALE SOUTH PLUME OU

| Aquifer Zone | Monitoring Wells Included in Quantitative Risk Evaluation | |
|---|---|---|
| Upper | PO-VPB-01 | PHC-MW-11 |
| | PO-VPB-02 | PHC-MW-12 |
| | PO-CO2-52 | PHC-MW-13 |
| | AGL-MW-1 | PHC-MW-14 |
| | AGL-MW-2 | PHC-MW-15 |
| | AGL-MW-3 | PHC-OS-01 |
| | PHC-MW-01 | PHC-EW-01 |
| | PHC-MW-02 | FRC-OW-01[a] |
| | PHC-MW-03 | FRC-OW-02[a] |
| | PHC-MW-04 | FRC-OW-03[a] |
| | PHC-MW-05 | FRC-OW-04[a] |
| | PHC-MW-06 | FRC-OW-05[a] |
| | PHC-MW-07 | FRC-WCW-01[a] |
| | PHC-MW-08 | FRC-WCW-02[a] |
| | PHC-MW-09 | FRC-WCW-03[a] |
| | PHC-MW-10 | FRC-WCW-04[a] |
| Lower | PO-CO1-195 | |
| | PO-CO1-354 | |
| | PO-CO2-205 | |

[a] Results available only for priority pollutant metals and nitrate

residential use and (2) exposure from discharge into the Los Angeles River.

EPA included three potential exposure routes in the Glendale North OU risk assessment: (1) drinking the groundwater during residential use and (2) inhaling the chemicals in groundwater vapors during showering. Dermal contact was also considered but was found by EPA not to pose a significant risk.

In accordance with current scientific opinion concerning carcinogens, it is assumed that any dose, no matter how small, has some associated response. This is called a nonthreshold effect. In the risk assessment for the Glendale South OU, the non-threshold effect was applied to all probable carcinogens. EPA has classified carcinogens with regard to the epidemiologic and toxicologic data available. The assessment of noncarcinogenic effects is complex. There is a broad interaction of time scales (acute, subchronic, and chronic) with varying kinds of effects. In addition, there are various levels of "severity" of effect. The Hazard Index is used to determine the potential for adverse health effects resulting from exposure to non-carcinogenic chemicals.

The Hazard Quotient is defined as the ratio of a single exposure level over a specified time period to a reference dose for that substance derived from a similar exposure period. A reference dose (RfD) is EPA's preferred toxicity value for evaluating non-carcinogenic effects resulting from exposures at Superfund sites. The Hazard Index is the sum of more than one Hazard Quotient for multiple substances or multiple pathways. The Hazard Index is calculated separately for chronic, sub-chronic and shorter-duration exposures. A Hazard Index greater than 1.0 indicates the potential for adverse health effects. However, it should be noted that a Hazard Index value of 1.0 or greater does not mean that an adverse health effect is certain. It is a benchmark value indicating a greater probability for a possible adverse effect.

A quantitative analysis for potential human exposures was performed during the remedial investigation of the Glendale Study Area. The groundwater quality data were used to calculate the arithmetic mean and upper confidence limit (95 percent) of the arithmetic mean for the upper zone and the lower zone of the South Plume OU.

The methods and equations used to calculate the exposure due to ingestion of drinking water and inhalation of vapors during showering are described in Section 7.3.4 of the Remedial Investigation Report for the Glendale Study Area (January 1992). The results of the baseline risk characterization for the upper and lower zones of the aquifer are summarized in Tables 7-3 and 7-4 of this ROD. A summary of hazard index calculations for nitrate in groundwater is included in Table 7-5 of this ROD. A detailed discussion of the data presented in these tables is included in

TABLE 7-3

SUMMARY OF RISK CHARACTERIZATION FOR THE
UPPER ZONE AQUIFER
FOR THE GLENDALE SOUTH PLUME OU

| Exposure Scenario | Arithmetic Mean[1] | RME[2] | Maximum[3] | Type of Risk |
|---|---|---|---|---|
| Adult Ingestion | 8.00E-04 | 2.00E-03 | 1.00E-02 | Cancer Risk |
| | 2.00E+01 | 7.00E+01 | 1.00E+02 | Hazard Index |
| Shower Inhalation | 1.00E-03 | 4.00E-03 | 2.00E-02 | Cancer Risk |
| | 2.00E+01 | 6.00E+01 | 9.00E+01 | Hazard Index |

1 Average Value

2 Reasonable Maximum Exposure. The highest exposure that is reasonable expected to occur at a site (95% upper confidence limit of observed concentrations).

3 The exposure scenario using the highest observed concentration in any monitoring well in the south plume of groundwater contamination in the Glendale Study Area. EPA considers this scenario to be unreasonably high.

**TABLE 7-4**

**SUMMARY OF RISK CHARACTERIZATION FOR THE LOWER ZONE AQUIFER FOR THE GLENDALE SOUTH PLUME OU**

| Exposure Scenario | Arithmetic Mean[1] | Maximum[2] | Type of Risk |
|---|---|---|---|
| Adult Ingestion | 2.00E-05 | 5.00E-05 | Cancer Risk |
| | 2.00E-01 | 4.00E-01 | Hazard Index |
| Shower Inhalation | 5.00E-07 | 8.00E-07 | Cancer Risk |
| | 1.00E-01 | 4.00E-01 | Hazard Index |

1 Average Value

2 The exposure scenario using the highest observed concentration in any monitoring well in the south plume of groundwater contamination in the Glendale Study Area. EPA considers this scenario to be unreasonably high.

**TABLE 7-5**

**SUMMARY OF HAZARD INDEX CALCULATIONS FOR NITRATE IN GROUNDWATER FOR THE GLENDALE SOUTH PLUME OU**

| Aquifer Zone | Arithmetic Mean[1] | RME[2] | Maximum[3] |
|---|---|---|---|
| Upper | 1E+00 | 2E+00 | 2E+00 |
| Lower | 4E-01 | ----[a] | 8E-01 |

1 Average Value

2 Reasonable Maximum Exposure. The highest exposure that is reasonable expected to occur at a site (95% upper confidence limit of observed concentrations).

3 The exposure scenario using the highest observed concentration in any monitoring well in the south plume of groundwater contamination in the Glendale Study Area. EPA considers this scenario to be unreasonably high.

a Not calculated due to small sample set.

Section 8.0 of the RI Report.

The risk associated with ingestion of groundwater from the upper zone found that the major contributors to the total risk value are methylene chloride, arsenic, benzene, 1,1-DCE, vinyl chloride, PCE and TCE, in descending order of risk contribution. For shower inhalation risks, methylene chloride is the most significant contributor to the overall risk. Benzene, 1,1-DCE, and TCE are secondary contributors.

As can be seen from Table 7-3, the total cancer risk values for estimates of concentrations at point of exposure for this pathway (i.e., ingestion of groundwater from the upper zone) are 8E-04, 2E-03, and 1E-02 for the arithmetic mean, upper bound 95 percent confidence interval, and the maximum concentrations in groundwater, respectively. The total noncarcinogenic risk values for estimates of concentrations at point of exposure for this pathway are 2E+01, 7E+01, and 1E+02 for the arithmetic mean, upper bound 95 percent confidence interval, and the maximum concentrations in groundwater, respectively. The noncarcinogenic risk values for exposure to nitrate in the upper zone is 2E+00, for the upper bound 95 percent confidence interval, which exceeds the benchmark of 1.0.

Table 7-3 also contains a summary of risk characterization for inhalation of groundwater from the upper zone. The total carcinogenic risk values for estimates for concentrations at point of exposure for this pathway are 1E-03, 4E-03, and 2E-02 for the arithmetic mean, upper bound 95 percent confidence interval, and the maximum concentrations in groundwater, respectively. Methylene chloride is the most significant contributor to the overall risk. The total noncarcinogenic risk values for estimates of concentrations at point of exposure for this pathway are 2E+01, 6E+01, and 9E+01 for the arithmetic mean, upper bound 95 percent confidence interval, and the maximum concentrations in groundwater, respectively. Benzene is the single most significant contributor to the elevated hazard index.

Table 7-4 summarizes the risk characterization for the lower zone aquifer. The total carcinogenic risk values for estimates for concentrations at point of exposure for ingestions are 2E-05 and 5E-05 for the arithmetic mean and the maximum concentrations in groundwater, respectively. TCE and bis(2-ethylhexyl)phthalate were the only carcinogenic compounds detected in the lower zone carried into the quantitative assessment for risk through ingestion. Of these, bis(2-ethylhexyl)phthalate is the most significant contributor to risk levels above 1E-06. The total noncarcinogenic risk values for all three of the compounds quantified are below the benchmark of 1.0 for the arithmetic mean and maximum concentrations at point of exposure for ingestion of groundwater from the lower zone. The noncarcinogenic risk values calculated for nitrate were also below the benchmark of 1.0.

TCE was the only carcinogenic compound detected in the lower zone to be quantified for risk due to inhalation. The risk levels for the estimates of concentrations for this pathway are 5E-07 and 8E-07 for the arithmetic mean and maximum values, respectively. Both risk values are below 1E-06. The sum of noncarcinogenic risk values for all three of the compounds quantified are below the benchmark of 1.0 for the arithmetic mean and maximum concentrations at point of exposure for inhalation of groundwater from the lower zone.

The uncertainties associated with the Glendale South OU risk assessment are discussed in detail in Section 8.6 of the Remedial Investigation Report for the Glendale Study Area (January 1992).

In summary, the results of the human health portion of the Glendale South OU risk assessment indicated that contaminant levels in the upper zone of the aquifer of the Glendale Study Area would pose an unacceptable ($2 \times 10^{-3}$) risk to human health if this water were to be delivered directly to local residents, without being treated. This means that an individual exposed to the conservatively high conditions used in the risk assessment (eg, consume two liters of untreated water every day over a 70-year lifetime) would have an increased chance (1 in 500) of developing cancer during their lifetime.

Environmental Risk Assessment

An ecological risk assessment was also performed for the Glendale South OU to address the potential ecological risks to flora and fauna in the area (see Section 8.7 of the Remedial Investigation Report for the Glendale Study Area, January 1992). This assessment provided a qualitative evaluation of potential current and future risks represented by the present site conditions, assuming no remedial action is taken in the Glendale Study Area.

The Glendale Study Area is zoned for commercial and industrial establishments. The surrounding area is a mixture of residential and commercial zoning. Although an extensive ecological survey was not performed for the area, the presence of a significant wildlife population was not indicated. In addition, the developed condition of the site excludes the potential for significant natural vegetative cover.

The release pathway of primary concern at this site is contaminated groundwater to the Los Angeles River. Discharge occurs under rising water conditions in the aquifer due to lack of production well pumping in this area. However, discharges are expected to be infrequent, seasonal, and localized.

Given the present developed condition of the site and the major exposure pathway consideration of contaminated groundwater,

there was no expectation for significant impact to potential environmental receptors. Urbanization has already replaced habitat potential; therefore, no significant number of receptors appeared to be present. There appeared to be no apparent mechanism for exposure to environmental receptors from contaminated groundwater. Also, there was no indication that future site plans would reinstate habitat and thereby recreate a potential for environmental receptors in the future.

## 8.0 DESCRIPTION OF ALTERNATIVES

Based on the results of the RI, EPA identified several cleanup alternatives for addressing groundwater contamination in the Glendale South Plume. The alternatives were developed to meet the following specific cleanup objectives for the Glendale South OU:

- To inhibit vertical and horizontal migration of groundwater contamination in the South Plume of the Glendale Study Area
- To begin to remove contaminant mass from the upper zone of the aquifer in the South Plume of the Glendale Study Area.

All of the alternatives, with the exception of the "no action" alternative (Alternative 1), involve groundwater extraction and treatment for the shallow aquifer system in the Glendale area of the San Fernando Valley. The upper zone or shallow-most portion of the aquifer is where the majority of the VOC contamination has been identified. Detailed descriptions of the various alternatives are presented in the Feasibility Study for the Glendale Study Area South Plume Operable Unit (August 1992).

Initially, all of the alternatives were screened for: 1) effectiveness at protecting public health and the environment, 2) technical feasibility (implementability), and 3) cost. As a result of this initial screening, six alternatives were evaluated using nine specific criteria: 1) Overall Protection of Human Health and the Environment, 2) Compliance with Applicable or Relevant and Appropriate Requirements (ARARs), 3) Long-term Effectiveness and Permanence, 4) Reduction of Toxicity, Mobility or Volume through Treatment, 5) Short-term Effectiveness, 6) Implementability, 7) Cost, 8) State Acceptance, and 9) Community Acceptance. Each of EPA's nine evaluation criteria is summarized below.

Overall Protection of Human Health and the Environment: This criterion assesses whether each alternative provides for both short term and long term overall protection of human health and the environment from unacceptable risks posed by the hazardous substances, pollutants, or contaminants present in the South Plume. The assessment draws upon the evaluation of short-term effectiveness, long-term effectiveness, implementability, reduction

of toxicity, mobility and/or volume through treatment, and compliance with ARARs.

Compliance with ARARs: This criterion is used to determine whether the alternative meets all of the chemical-, action- and location-specific ARARs identified in Section 10 of this ROD. Since the remedial action established by the Glendale South OU ROD is an interim action, chemical-specific requirements to be attained in the aquifer at the end of the final remedy are not ARARs for this action. Action-specific ARARs address the groundwater response actions that may be taken as part of this interim action for the Glendale South OU. All of the alternatives, except no action, include groundwater extraction followed by treatment and use as potable supply or disposal. Therefore, specific levels for treatment of the contaminated water prior to disposal or to delivery to the drinking water purveyor are chemical-specific and action-specific ARARs for the Glendale South OU.

Long-Term Effectiveness and Permanence: Long-term effectiveness refers to the period after the remedial action is complete. Each alternative is assessed for its long-term effectiveness and permanence in reducing the risk to human health and the environment at the end of the 12-year period. The long-term effectiveness evaluation focuses on how well the contamination has been contained by the remedial action and what are the contaminant concentrations remaining in the aquifer at the end of the 12-year period.

Reduction of Toxicity, Mobility, and/or Volume through Treatment: This criterion addresses how well the remediation technologies permanently and significantly reduce the toxicity, mobility and/or volume of the hazardous substances. The evaluation based on this criterion focuses on the quantity of hazardous materials destroyed or treated, the degree to which the remedial action is irreversible, the type and quantity of residuals that are remaining after the remedial action is complete, and whether the alternative satisfies the statutory preference for treatment as a principal element of the remedy.

Short-Term Effectiveness: Each alternative is evaluated based on its effectiveness in protecting human health and the environment during the construction and implementation period. The short-term effectiveness evaluation for each alternative focuses on how well the alternative removes contaminant mass, inhibits the movement of the contaminant plume, and how well the treatment system meets the cleanup levels in the extracted and treated groundwater during the 12-year period. Short-term effectiveness also addresses the effectiveness of the alternative in reducing potential risks to people living in the vicinity of the Glendale South Plume and to workers' health and safety during construction of the proposed facilities and implementation of the interim remedy.

Implementability: The implementability criterion includes both the technical and administrative feasibility of implementing an alternative. The technical feasibility refers to the ability to construct, reliably operate and maintain, and meet cleanup levels for process options. Administrative feasibility refers to the ability to obtain approvals from other offices and agencies, the availability and capacity of treatment, storage, and disposal services, and the availability of specific equipment and technical specialists.

Cost: The NCP requires that the following types of costs be evaluated: 1) Capital costs, including both direct and indirect costs, 2) Annual operation and maintenance costs and 3) Net present value of capital and operations and maintenance (O&M) costs. Capital and O&M costs presented in the Glendale South OU FS report have an accuracy of +50 percent to -30 percent, as specified by the Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988). Capital costs include a contingency of 20 percent of total field costs (TFC) and a contractor's overhead and profit (OH&P) at 30 percent of the sum of TFC and contingency. Evaluating present worth costs assumes an interest rate of 10 percent and operating period of 12 years. The O&M cost evaluation assumes an operating load factor of 90 percent.

State Acceptance: This criterion considers the concerns of the State (technical and administrative) regarding the alternatives.

Public Acceptance: This criterion assesses the components of alternatives that interested persons in the community support, have reservations about or oppose.

EPA's preferred alternative, as well as the other five alternatives were described in EPA's Proposed Plan for the Glendale South OU (September 1992).

The Glendale South OU is an interim action and is not the final remedy for cleanup of contaminated groundwater in the Glendale area. With the exception of the no action alternative, all of the alternatives involve the extraction of 2,000 gpm of groundwater for a period of 12 years. The total duration of the remedy is 15 years, but during the first three years the remedy will be in the remedial design and construction phases and no extraction or treatment of groundwater will be taking place. A computer model called a solute transport model was developed and used to determine that the extraction rate of 2,000 gpm over a 12 year period would result in the most effective inhibition of plume migration and effective contamination removal for this interim action. With the exception of Alternative 1 - No Action, all of the alternatives would involve the construction and operation of a VOC treatment system.

With the exception of Alternative 1 - No Action, the six alternatives analyzed and compared during the FS and presented in the Glendale South OU FS report include four major elements: 1) extraction of contaminated groundwater at the rate of 2000 gpm, 2) treatment of the VOCs, 3) treat/blend/no action for nitrates, and 4) one of three options for final use - distribution to a public water supply system, spreading at an existing spreading grounds, or discharge to the Los Angeles River (See Table 8-1). The major elements of each of six alternatives are listed below.

| | |
|---|---|
| Alternative 1 | No Action |
| Alternative 2 | Extract/Treat VOCs (either air stripping w/vapor-phase GAC or liquid-phase GAC)/Blending for Nitrate/Public Water Supply |
| Alternative 3 | Extract/Treat VOCs (perozone)/ Blending for Nitrate/Public Water Supply |
| Alternative 4 | Extract/Treat VOCs (either air stripping w/vapor-phase GAC or liquid-phase GAC)/No nitrate treatment/River |
| Alternative 5 | Extract/Treat VOCs (either air stripping w/vapor-phase GAC or liquid-phase GAC)/Ion Exchange for nitrate/Recharge at Headworks Spreading Ground |
| Alternative 6 | Extract/Treat VOCs (either air stripping w/vapor-phase GAC or liquid-phase GAC)/No nitrate treatment/Recharge at Headworks Spreading Grounds |

The highlights of the six alternatives are summarized briefly below. More detailed descriptions of the alternatives are presented in the Feasibility Study for the Glendale Study Area South Plume Operable Unit (August 1992).

Alternative 1: No Action

The No Action alternative serves as a "baseline" against which other alternatives are compared. This alternative is evaluated to determine the risks that would be posed to public health and the environment if no action were taken to treat or contain the contamination. The no action alternative would involve only

**TABLE 8-1**
**SUMMARY OF ALTERNATIVES**

| COMPONENTS | ALTERNATIVE 1 | ALTERNATIVE 2 | ALTERNATIVE 3 |
|---|---|---|---|
| Groundwater Extraction | None | Extract 2000 gpm of groundwater. | Same as Alternative 2. |
| Treatment | None | Treat VOCs with either air stripping and vapor-phase GAC or liquid-phase GAC.<br><br>Meet nitrate MCL by blending.<br><br>Chromium treatment to be added if necessary. | Treat VOCs with perozone oxidation, airstripping and vapor-phase GAC.<br><br>Same as Alternative 2.<br><br>Same as Alterantive 2. |
| Final Use | Monitor groundwater quality | Convey treated, blended water to water purveyor. | Same as Alternative 2. |
| CRITERIA | EVALUATION | | |
| Effectiveness and Permanence | Not effective in the short- or long-term | Inhibit vertical and lateral mitration of contaminant plume.<br><br>Significantly reduced contaminated groundwater discharge to LA River.<br><br>Remove contaminant mass from aquifer.<br><br>Treated, blended groundwater would meet drinking water standards. | Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Same as Alternative 2. |
| Reduction of Toxicity, Mobility, Volume through Treatment | No reduction of toxicity, mobility, or volume | Estimated to reduce TCE concentrations in the aquifer from 200 ppb to less than 10 ppb after 12 years.<br><br>Removes 80% of the initial mass of TCE in the aquifer. | Same as Alternative 2.<br><br>Same as Alternative 2. |
| Compliance with ARARs | Will not meet ARARs | Will meet ARARs. | Same as Alternative 2. |
| Overall Protection of Human Health and Environment<br><br>(Human Health)<br><br>(Environment) | Assuming no institutional controls, increased cancer risk of ingesting contaminated groundwater is estimated to be 1 in 500.<br><br>Not protective of environment. | Protective of human health.<br><br>Environmental degradation will be reduced because migration of groundwater containing TCE concentrations inhibited and TCE mass removed. | Same as Alternative 2.<br><br>Same as Alternative 2. |
| Implementability (Technical) | Monitoring wells easy to construct. Spread of groundwater plume could make future remediation difficult. | Can be implemented | Can be implemented. Perozone oxidation only proven in pilot-scale tests. |
| ESTIMATED COSTS | | | |
| Total Capital Cost<br>Annual O&M<br>Total Present Worth | $211,000*<br>$109,000*<br>$769,000* | $15,540,000*<br>$1,852,000*<br>$25,020,000* | $16,620,000*<br>$1,729,000*<br>$25,470,000* |

* If chromium treatment is needed, additional capital costs are expected to be $2,950,000, additional annual O&M $611,000, and additional total present worth costs $6,750,000.

**TABLE 8-1 (Continued)**
**SUMMARY OF ALTERNATIVES**

| ALTERNATIVE 4 | ALTERNATIVE 5** | ALTERNATIVE 6 |
|---|---|---|
| Same as Alternative 2. | Same as Alternative 2. | Same as Alternative 2. |
| Same as Alternative 2.<br><br>No nitrate treatment.<br><br>Same as Alternative 2. | Same as Alternative 2.<br><br>Treatment of nitrate with ion exchange.<br><br>Same as Alternative 2. | Same as Alternative 2.<br><br>No nitrate treatment.<br><br>Same as Alternative 2. |
| Discharge treated water to Los Angeles River. | Discharge treated water to Headworks Spreading Grounds. | Same as Alternative 5. |
| | | |
| Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Treated groundwater would meet drinking water standards for VOCs and surface discharge standards for nitrates. | Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Same as Alterantive 2.<br><br>Treated groundwater would meet drinking water standards for VOCs and nitrates. | Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Same as Alternative 2.<br><br>Treated groundwater would meet drinking water standards for VOCs and recharge requirements. |
| Same as Alternative 2.<br><br>Same as Alternative 2. | Same as Alternative 2.<br><br>Same as Alternative 2. | Same as Alternative 2.<br><br>Same as Alternative 2. |
| Same as Alternative 2. | Same as Alternative 2. | Same as Alternative 2. |
| Same as Alternative 2.<br><br>Same as Alternative 2. | Same as Alternative 2.<br><br>Same as Alternative 2. | Same as Alternative 2.<br><br>Same as Alternative 2. |
| Can be implemented. Administrative concerns associated with objection to non-beneficial use of water. | Can be implemented, except issues associated with waste brine disposal from nitrate treatment facility and availability of Headworks Spreading Grounds | Can be implemented; one administrative issue may be the availability of the Headworks Spreading Grounds for recharge. |
| | | |
| $10,611,000*<br>$1,384,000*<br>$17,700,000* | $25,140,000*<br>$2,464,000*<br>$37,750,000* | $14,160,000*<br>$1,613,000*<br>$22,420,000* |

** Alternative 5 was formerly Alternative 8 in the Feasibility Study for the Glendale Study Area: South Plume Operable Unit (August 1992)

groundwater monitoring; no additional cleanup activities would be conducted.

Alternative 2: EPA's Preferred Alternative: Extract/Treat(either Air Stripping w/Vapor-Phase GAC or Liquid-Phase GAC/Blend for nitrates/Public Water System

Alternative 2 involves the extraction of 2,000 gpm of contaminated groundwater for 12 years. The extraction wells would be located to inhibit most effectively the migration of the contaminant plume. Various locations and scenarios for extraction wells and rates of extraction are proposed in the feasibility study report for the Glendale South OU. However, all design decisions for this interim remedy will be made during the remedial design phase. At that time, one of the locations proposed for extraction wells and scenarios for rates of extraction at individual wells may be selected or new ones may be selected.

The extracted groundwater will be filtered to remove any suspended solids, if necessary, and then treated for VOCs using dual-stage or single-stage air stripping with vapor-phase GAC adsorption for emissions control or liquid-phase GAC. Whether air-stripping (dual versus single) or liquid phase GAC will be used will be determined during remedial design as will the exact location for the treatment plant. If necessary to meet drinking water standards, a chromium reduction and filtration unit will be added to the treatment train. The treated water will be blended with water of a quality such that the treated, blended water would meet all drinking water standards (including the nitrate MCL). The treated water shall meet all ARARs identified in Section 10 of this ROD and will be conveyed to the City of Glendale and/or another San Fernando Valley water purveyor for blending and distribution through the public water supply system. The blended water will have to meet all applicable drinking water requirements for drinking water in existence at the time that the water is served prior to distribution through the public drinking water supply system.

In response to comments by the City of Glendale on the Glendale North and South OU Proposed Plans and in order to decrease overall costs associated with the OUs, EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined at a single location and the total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact location and configuration of the combined treatment plant will be determined during the remedial design phase of the project. The Glendale North OU Record of Decision will also reflect this decision to combine the treatment plants. However, if the City of Glendale does not accept any or all of the treated water (possibly due to water supply needs), any remaining portion of water will be: 1) offered to another San Fernando Valley water purveyor or 2)

recharged into the aquifer at the Headworks Spreading Grounds per Alternative 6 (see description below).

If EPA determines that combining the treatment plants will significantly delay or hinder the implementation of the Glendale South OU, a separate Glendale South OU treatment plant will be constructed and the water will be conveyed to another San Fernando Valley water purveyor. Two of the possible locations for the treatment plant in the Glendale South OU are proposed in the Glendale South OUFS report. As a further contingency, if a municipality or municipalities do not accept all or part of the treated water from a separate Glendale South OU treatment plant (possibly due to water supply needs), the extracted treated water will be conveyed to the Headworks Spreading Grounds where it will be recharged to the aquifer.

Groundwater monitoring wells will be installed to evaluate the effectiveness of the remedial action. More specifically, groundwater monitoring shall be conducted no less frequently than quarterly to: 1) evaluate influent and effluent water quality, 2) determine and evaluate the capture zone of the extraction wells, 3) evaluate the vertical and lateral (including downgradient) migration of contaminants, 4) evaluate the effectiveness of the recharge system, if necessary and 5) monitor any other factors associated with the effectiveness of the interim remedy determined to be necessary during remedial design.

Alternative 3: Extract/Treat(Perozone Oxidation)/Blending for Nitrates/Public Water System

Alternative 3 also requires the extraction of 2,000 gpm of contaminated groundwater for 12 years, and the same final use of the treated water and the same groundwater monitoring requirements as Alternative 2. Alternative 3 only differs from Alternative 2 in that the extracted groundwater would be treated for VOCs using perozone oxidation, followed by either air stripping with vapor-phase GAC adsorption for emissions control or liquid phase GAC. Air stripping or liquid-phase GAC would be required to remove any carbon tetrachloride in the extracted groundwater because the perozone oxidation process alone does not effectively treat this VOC. If necessary to meet drinking water standards, a chromium reduction and filtration unit will be added to the treatment train.

Alternative 4: Extract/Treat (either Air Stripping w/Vapor-Phase GAC or Liquid-Phase GAC)/No Nitrate Treatment/River

Alternative 4 also involves the extraction of 2,000 gpm of contaminated groundwater for 12 years, and the same treatment methodology and the same groundwater monitoring requirements as Alternative 2. As with Alternative 2, if necessary to meet drinking water standards, a chromium reduction and filtration unit will be added to the treatment train. However, rather than

providing the treated water to a public water purveyor, the treated water would be discharged to the Los Angeles River.

Alternative 5[1]: Extract/Treat (either Air Stripping w/Vapor-Phase GAC or Liquid-Phase GAC)/Ion Exchange for Nitrates/Recharge at Spreading Grounds

Alternative 5 also involves the extraction of 2,000 gpm of contaminated groundwater for 12 years, and the same treatment and monitoring requirements as Alternative 2. As with Alternative 2, if necessary to meet drinking water standards, a chromium reduction and filtration unit will be added to the treatment train. Alternative 5 differs from Alternative 2 in that after treatment for VOCs, the water would be treated using ion exchange to reduce the nitrate levels in the water to meet the nitrate MCL. The treated water would then be recharged at a spreading ground.

Alternative 6: Extract/Treat (either Air Stripping w/Vapor-Phase GAC or Liquid-Phase GAC)/No Nitrate Treatment/Recharge at Spreading Grounds

Alternative 6 also involves the extraction of 2,000 gpm of contaminated groundwater for 12 years, the same treatment approach as described in Alternative 2 and the same ground water monitoring requirements as Alternative 2. As with Alternative 2, if necessary to meet drinking water standards, a chromium reduction and filtration unit will be added to the treatment train. However, unlike Alternative 2, the treated water would be recharged to the aquifer at the Headworks Spreading Grounds. No blending or treatment for nitrates would occur prior to recharge.

## 9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A comparative analysis of the alternatives against the nine evaluation criteria is presented in this section.

**No Action versus the Nine Criteria.** Clearly, Alternative 1 would not be effective in the short- and long-term in protecting human health and the environment as it does not provide for removing any contaminants from the upper zone of the aquifer, for inhibiting further downgradient and vertical contaminant plume migration, or for reducing the toxicity, mobility and volume of contaminants through treatment. Implementing the no-action alternative would be simple and inexpensive since it involves only groundwater monitoring. As indicated by the baseline risk assessment for the Glendale South OU presented in the RI Report for the Glendale Study Area (January 1992), Alternative 1 could pose both carcinogenic and

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[1] Note: Alternative #5 as presented in this ROD was formerly Alternative #8 in the Feasibility Study for the Glendale Study Area: South Plume Operable Unit (August 1992).

non-carcinogenic risk if a person were exposed to the groundwater from the upper zone of the aquifer. Loss of a valuable water resource from continued degradation of the aquifer and discharge of valuable water to the river is a major concern.

**Overall Protection of Human Health and the Environment, Short Term Effectiveness and Long Term Effectiveness.**

Alternatives 2, 3, 4, 5, and 6 have the same effectiveness in the short and long term in reducing the risk to human health and the environment by removing contaminants from the Upper Zone of the aquifer; by inhibiting further downgradient contaminant migration; and by reducing the toxicity, mobility, and volume of contaminants in the aquifer. During the first 12 years of operation, these alternatives are estimated to remove approximately 80 percent of the total estimated initial dissolved-phase TCE mass, with a peak TCE concentration of 10 ug/l remaining in the Upper Zone of the aquifer.

**Reduction of Toxicity, Mobility and Volume through Treatment.** The VOC treatment technologies used in Alternatives 2, 4, 5, and 6 (either air stripping with vapor-phase GAC adsorption or liquid phase GAC adsorption) and used in Alternative 3 (perozone oxidation followed by either air stripping with vapor-phase GAC adsorption or liquid-phase GAC) are technically feasible and effective in meeting ARARs for VOCs in the extracted and treated groundwater. Treatment of the extracted contaminated groundwater via air stripping with vapor-phase GAC adsorption or liquid phase GAC adsorption would reduce substantially the toxicity and mobility of contaminants in the aqueous phase. The adsorption of contaminants onto the GAC would reduce the volume of contaminated media. However, a substantially larger quantity of contaminated GAC media would be generated with either air stripping with vapor-phase GAC or liquid-phase GAC systems compared to perozone oxidation (which is a destructive technology) followed by either air stripping with vapor-phase GAC adsorption or liquid-phase GAC. This contaminated GAC would require disposal or regeneration.

Treatment of the extracted contaminated groundwater via perozone oxidation followed by either air stripping with vapor-phase GAC adsorption or liquid-phase GAC would destroy greater than 90 percent of the VOCs, and generate a smaller quantity of contaminated GAC media compared to air stripping with vapor-phase GAC alone. VOC treatment using perozone oxidation has only been tested and applied in pilot-scale/limited applications, and limited O&M data are available; however, a demonstration-scale (2,000-gpm) facility has begun operation in North Hollywood for treating TCE- and PCE-contaminated groundwater. This prototype facility should provide useful information regarding the long-term performance and O&M costs.

As a result of comments received during the public comment period for the Glendale North OU, EPA further evaluated the use of perozone oxidation for the Glendale South OU. Additional research on perozone use and revised cost estimates based on a bench scale treatability study can be found in the following technical memorandum: Applicability of Perozone Treatment Process for the Glendale North Operable Unit Groundwater Remediation (March 12, 1993) included in the Administrative Record for the Glendale South OU available at all five information repositories for the San Fernando Valley Superfund sites. Carbon tetrachloride, which is one of the contaminants found in the groundwater of the Glendale South plume, is not as readily treated using the perozone process and must be treated using air-stripping or liquid phase GAC to ensure that the treated water will meet all drinking water standards for VOCs. In addition, incomplete oxidation can lead to the formation of by-products such as formaldehyde which would also need to addressed. The bench scale treatability study found that the total present worth cost estimated in the FS report is underestimated and $500,000 or more could be added to the estimated $31,200,000. These factors coupled with the uncertainties associated with design, capital and operational costs and reliability, and finally the fact that a municipality will be receiving this water, all combine to make Alternative 3 less preferable than Alternatives 2 and 4 through 6 which propose using air stripping or liquid phase GAC for VOC treatment.

**Compliance with ARARs.** As discussed in the ARARs section (Section 10) of this ROD, since this remedial action is an interim action, there are no chemical-specific ARARs for aquifer cleanup for any of the alternatives. For Alternatives 2 through 6, the chemical-specific ARARs for the treated water from the VOC treatment plant at this site are Federal MCLs and more stringent State MCLs for VOCs. Alternatives 2, 4, 5, and 6 are expected to meet these ARARs for the treated water. There is some uncertainty regarding the ability of Alternative 3 to meet these ARARs because perozone has not been used to treat such high concentrations of VOCs at such high flow rates. Therefore, there is the potential for not meeting MCLs unless the air stripping or liquid-phase GAC unit following the perozone system is a redundant treatment system (which would add substantially to the cost).

For the Alternatives that involve distribution of the treated water to a public water supply system (Alternatives 2 and 3), secondary drinking water standards are ARARs and will be met prior to blending of the water for nitrate. For water that will be served at the tap, all applicable requirements will have to be met after blending, including the nitrate MCL. For Alternatives 5 and 6, the nitrate levels in the treated groundwater will meet ARARs by ensuring that recharge of the treated groundwater occurs where levels of these substances in the receiving aquifer are similar to those in the treated water to be recharged or that the water will be treated for nitrates prior to recharge. EPA has confirmed that

nitrate levels in the groundwater beneath the Headworks Spreading Grounds are similar to the nitrate levels observed in the vicinity of proposed extraction well sites. In Alternative 4, the treated water will meet MCLs for VOCs prior to discharge to the Los Angeles River (which is on-site).

**Implementability.** Technically and administratively, Alternatives 2, 3, 4 and 6 could be implemented. The technologies considered for groundwater monitoring, extraction, and conveyance are proven and have been applied extensively. For Alternative 6, the availability of the Headworks Spreading Grounds for discharge of extracted and treated groundwater would need to be addressed. Technically, Alternative 5 could probably be implemented, but using ion exchange for nitrate treatment poses some technical and administrative feasibility issues. In particular, disposing of the waste brine generated from backwashing the ion exchange system may restrict the technical and administrative feasibility of using ion exchange for nitrate treatment.

EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined. The total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact configuration of the combined treatment plant will be determined during the remedial design phase of the project. The City of Glendale has indicated that it has sufficient water credits and capacity in their existing water system to accept this amount of extracted treated water. Therefore, combining the treatment plants for the Glendale North and South OUs would be implementable.

**State and Public Acceptance.** Based on comments received during the public comment period, the public generally expressed support for Alternatives 2 through 6. EPA received comments from the City of Glendale and members of the Glendale community specifically in support of Alternatives 2 and 6. Comments received during the public comment period along with EPA responses are presented in Part III of this ROD, the Responsiveness Summary. In a letter dated May 28, 1993, the State (Cal-EPA) agreed with EPA's selected remedy for the Glendale South OU. The State Water Resources Control Board did not support Alternative 4 which involves discharge to the Los Angeles River because this alternative does not put the treated water "to beneficial use to the fullest extent of which they are capable."

A public meeting was held in the City of Glendale on October 21, 1992, to discuss EPA's preferred alternative and the other alternatives. At this meeting EPA gave a brief presentation regarding the Proposed Plan, answered questions, and accepted comments from members of the public.

In their written comments during the public comment period for the Glendale South Proposed Plan, the City of Glendale emphasized

that it would like to receive more than just the 3,000 gpm of extracted, treated groundwater proposed for Glendale North and that the City would accept the water from both North and South OUs. The City also indicated that it had stored water credits and water rights sufficient to accept greater than 5,000 gpm of extracted, treated groundwater from the San Fernando Valley. As a result of the City's comments on the Glendale North and South OUs and the cost analysis discussed below, EPA has determined that the treatment plants for the Glendale North and South OUs will be combined and the total 5,000 gpm of treated water will be conveyed to the City of Glendale.

**Cost.** The estimated total present worth of Alternatives 2, 3, 4, and 6 ranges from $17,700,000 to $25,470,000. The total present worth cost for Alternative 2 is $25,020,000 . The total present worth for Alternative 5 which includes nitrate treatment using ion exchange is $37,750,000. Using ion exchange for nitrate treatment adds significantly to the cost of the alternatives. If a chromium reduction and filtration unit is found to be necessary to meet drinking water standards this would add an estimated $6,750,000 to the total present worth of the alternatives.

EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined. The total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact configuration of the combined treatment plant will be determined during the remedial design phase of the project. The costs of the two separate OU projects is estimated to be $36,400,000 for Glendale North and $25,020,000 for Glendale South. Therefore, these two separate OU projects would total $61,420,000. Recent EPA cost estimates (included in the Glendale South OU Administrative Record) indicate that combining the Glendale North and South OUs could result in a total cost of $ 47,532,000, resulting in an estimated cost savings of $ 13,888,000.

Although the cost estimate for Alternative 2 is slightly higher than some of the other alternatives, these overall project costs do not take into account the value of utilizing the groundwater resource as opposed to disposing of the water in the Los Angeles River (Alternative 4) or recharging at the Headworks Spreading Ground (Alternatives 5 and 6).

## 10.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section discusses Applicable or Relevant and Appropriate requirements (ARARs) for the Glendale South OU. Under Section 121(d)(1) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986 (collectively, CERCLA), 42 U.S.C. § 9621(d) remedial actions must attain a level or standard of control of hazardous substances which complies with ARARs of

Federal environmental laws and more stringent state environmental and facility siting laws. Only state requirements that are more stringent than Federal ARARs, and are legally enforceable and consistently enforced may be ARARs.

Pursuant to Section 121(d) of CERCLA, the on-site portion of a remedial action selected for a Superfund site must comply with all ARARs. Any portion of a remedial action which takes place off-site must comply with all laws legally applicable at the time of the off-site activity occurs, both administrative and substantive.

An ARAR may be either "applicable", or "relevant and appropriate", but not both. According to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300), "applicable" and "relevant and appropriate" are defined as follows:

- Applicable requirements are those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. "Applicability" implies that the remedial action or the circumstances at the site satisfy all of the jurisdictional prerequisites of a requirement.

- Relevant and appropriate requirements are those cleanup standards, standard of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are identified in a timely manner and that are more stringent than Federal requirements may be relevant and appropriate.

**Chemical-Specific ARARs.** Chemical-specific ARARs are health- or risk-based concentration limits, numerical values, or methodologies for various environmental media (i.e., groundwater, surface water, air, and soil) that are established for a specific chemical that may be present in a specific media at the site, or that may be discharged to the site during remedial activities. These ARARs set

limits on concentrations of specific hazardous substances, pollutants, and contaminants in the environment. Examples of this type of ARAR are ambient water quality criteria and drinking water standards.

**Location-Specific ARARs.** Location-specific requirements set restrictions on certain types of activities based on site characteristics. Federal and state location-specific ARARs are restrictions placed on the concentration of a contaminant or the activities to be conducted because they are in a specific location. Examples of special locations possibly requiring ARARs may include flood plains, wetlands, historic places, and sensitive ecosystems or habitats.

**Action-Specific ARARs.** Action-specific requirements are technology- or activity-based requirements which are triggered by the type of remedial activities under consideration. Examples are Resource, Conservation and Recovery Act (RCRA) regulations for waste treatment, storage or disposal.

Neither CERCLA nor the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (400 C.F.R. Part 300) provides across-the-board standards for determining whether a particular remedy will result in an adequate cleanup at a particular site. Rather, the process recognizes that each site will have unique characteristics that must be evaluated and compared to those requirements that apply under the given circumstances. Therefore, ARARs are identified on a site-specific basis from information about specific chemicals at the site, specific features of the site location, and actions that are being considered as remedies.

The following section outlines the Applicable or Relevant and Appropriate Requirements (ARARs) that apply to this site.

## 10.1 Chemical-Specific ARARs

### 10.1.1 Federal Drinking Water Standards

Section 1412 of the Safe Drinking Water Act (SDWA), 42 U.S.C. S300g-1, "National Water Regulations"; National Primary Drinking Water Regulations, 40 CFR Part 141.

EPA has established Maximum Contaminant Levels (MCLs) (40 CFR Part 141) under the Safe Drinking Water Act (SDWA) to protect public health from contaminants that may be found in drinking water sources. These requirements are applicable at the tap for water provided directly to 25 or more people or which will be supplied to 15 or more service connections. The MCLs are applicable to any water that would be served as drinking water. Under NCP Section 300.430(f)(5), remedial actions must generally attain MCLs and non-zero Maximum Contaminant Level Goals (MCLGs) for remedial actions where the groundwater is currently or potentially a source of

drinking water.

The Glendale South groundwater is a potential source of drinking water. However, since the Glendale South OU remedial action is an interim action, chemical-specific cleanup requirements for the aquifer such as attaining MCLs and non-zero MCLGs, which would be ARARs for a final remedy, are not ARARs for this interim action. (See 55 Fed. Reg. 8755.) Nevertheless, EPA has determined that for the treatment plant effluent from the Glendale South OU, the Federal Maximum Contaminant Levels (MCLs) for VOCs and any more stringent State of California MCLs for VOCs are relevant and appropriate and must be attained regardless of the end use or discharge method for the treated water.

For the treated and blended water which will be put into the public water supply, all applicable requirements for drinking water in existence at the time that the water is served will have to be met because EPA considers the blending facility and the serving of the water to the public (at the tap) to be off-site. Complying with all applicable requirements for drinking water at the tap will also require attainment of the MCL for nitrate prior to serving the water to the public. Since these are not ARARs, these requirements are not "frozen" as of the date of the ROD. Rather, they can change over time as new laws and regulations applicable to drinking water change. See 55 Fed. Reg. 8758 (March 8, 1990). Figure 10-1 provides a diagram of the treatment chain and blending process for the treated water prior to distribution of the treated and blended water to the public water supply for Alternatives 2 and 3.

### 10.1.2 State Drinking Water Standards

California Safe Drinking Water Act, Health and Safety Code, Division 5, Part 1, Chapter 7, §4010 et seq., California Domestic Water Quality Monitoring regulations, CCR Title 22, Division 4, Chapter 15, §64401 et seq.

California has also established drinking water standards for sources of public drinking water, under the California Safe Drinking Water Act of 1976, Health and Safety Code Sections 4010.1(b) and 4026(c). California has promulgated MCLs for primary VOCs. Several of the State MCLs are more stringent than Federal MCLs. In these cases, EPA has determined that the more stringent State MCLs for VOCs are relevant and appropriate for the treatment plant effluent from the Glendale South OU interim remedy. The VOCs for which there are more stringent State standards include: benzene; carbon tetrachloride; 1,2-dichloroethane (1,2-DCA); 1,1-dichloroethene (1,1-DCE); cis-1,2-DCE; trans-1,2-DCE; and xylene. There are also some chemicals where State MCLs exist but there are no Federal MCLs. EPA has determined that these State MCLs are relevant and appropriate for the treated water prior to discharge or delivery to the water purveyor. The VOCs for which there are no Federal MCLs but for which State MCLs exist include: 1,1-DCA;

1,1,2,2-tetrachloroethane; and 1,1,2-trichloroethane.

Water served as drinking water is required to meet MCLs at the tap, not MCLGs. Therefore, EPA would generally not expect a future change in an MCLG to affect the use of treated groundwater as a drinking water source. The cumulative hazard index is also not an ARAR. However, EPA does retain the authority to require changes in the remedy if necessary to protect human health and the environment, including changes to previously selected ARARS. See 40 C.F.R. Sections 300.430(f)(1)(ii)(B)(1) and 300.430(f)(5)(iii)(C). If EPA receives new information indicating the remedy is not protective of public health and the environment, EPA would review the remedy and make any changes necessary to ensure protectiveness.

EPA has also determined that the monitoring requirements found in CCR Title 22 Sections 64421-64445.2 are relevant and appropriate for any treated water which will be delivered to the City of Glendale's Public Water distribution system. However, the selection of these sections as ARARs involves only the requirements that specific monitoring be performed. It would not include any administrative requirements (such as reporting requirements) and would also not include meeting substantive standards set within these sections since no such standards have been identified by the State as being more stringent than Federal requirements. For the off-site portion of this remedy, including the treated water after blending, all applicable requirements would have to be satisfied including the monitoring requirements in CCR Title 22 Sections 64421-64445.2.

Accordingly, the chemical-specific standards for the groundwater extracted and treated under the Glendale South OU interim remedy are the current Federal or State MCLs for VOCs, whichever is more stringent.

10.2 Location-Specific ARARs

No special characteristics exist in the Glendale Study Area to warrant location-specific requirements. Therefore, EPA has determined that there are no location-specific ARARs for the Glendale South OU.

10.3 Action-Specific ARARs

10.3.1 Clean Air Act, 42 U.S.C. §7401 et seq.

Rules and Regulations of the South Coast Air Quality Management District

Glendale South OU treatment of VOCs by air stripping, whereby the volatiles are emitted to the atmosphere, triggers action-specific ARARs with respect to air quality.

The Clean Air Act regulates air emissions to protect human health and the environment, and is the enabling statute for air quality programs and standards. The substantive requirements of programs provided under the Clean Air Act are implemented primarily through Air Pollution Control Districts. The South Coast Air Quality Management District (SCAQMD) is the district regulating air quality in the San Fernando Valley.

The SCAQMD has adopted rules that limit air emissions of identified toxics and contaminants. The SCAQMD Regulation XIV, comprising Rules 1401, on new source review of carcinogenic air contaminants is applicable for the Glendale South OU. SCAQMD Rule 1401 also requires that best available control technology (T-BACT) be employed for new stationary operating equipment, so the cumulative carcinogenic impact from air toxics does not exceed the maximum individual cancer risk limit of ten in one million ($1 \times 10^{-5}$). EPA has determined that this T-BACT rule is applicable for the Glendale South OU because compounds such as TCE and PCE are present in groundwater, and release of these compounds to the atmosphere may pose health risks exceeding SCAQMD requirements.

The substantive portions of SCAQMD Regulation XIII, comprising Rules 1301 through 1313, on new source review are also ARARs for the Glendale South OU.

The SCAQMD also has rules to limit the visible emissions from a point source (Rule 401), which prohibits discharge of material that is odorous or causes injury, nuisance or annoyance to the public (Rule 402), and limits down-wind particulate concentrations (Rule 403). EPA has determined that these rules are also ARARs for the Glendale South OU interim remedy.

### 10.3.2 Water Quality Standards for Discharges of Treated Water to Surface Waters or Land

State Standards

For any recharge to the basin, including spreading, or discharges to surface water that occur on-site, the recharged or discharged water must meet all action-specific ARARs for such recharge or discharge. The ARAR applicable to the recharged (Alternative 6) water is:

- The Los Angeles Regional Water Quality Control Board's Water Quality Control Plan, which incorporates State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California." Resolution No. 68-16 requires maintenance of existing State water quality unless it is demonstrated that a change will benefit the people of California, will not unreasonably affect

present or potential uses, and will not result in water quality less than that prescribed by other State policies.

In order to comply with this State ARAR, any treated groundwater that is recharged on-site will be treated to concentrations below Federal MCLs or State MCLs for VOCs, whichever is more stringent. In addition, any nitrate concentrations in the water to be recharged will have to be similar to or lower than the levels of these substances in the area of the aquifer where the recharge will occur. The quality and quantity of the water to be recharged, as well as the duration of the project, will be considered with respect to the existing water quality.

EPA anticipates that there may be short-term discharges of treated water to the Los Angeles River during the initial operation of the VOC treatment plant and on certain other limited occasions. The ARAR for any treated water that is discharged, on a short term basis, to the Los Angeles River is the National Pollutant Discharge Elimination System (NPDES) Program which is implemented by the LARWQCB. In establishing effluent limitations for such discharges, the LARWQCB considers the Water Quality Control Plan for the Los Angeles River Basin (the "Basin Plan"), which incorporates Resolution 68-16, and the best available technology economically achievable (BAT). See, Cal. Water Code § 13263.

Since the RWQCB did not identify specific substantive discharge requirements or technology standards for such temporary discharges, EPA has reviewed the Basin Plan and considered BAT and has made certain determinations for the short-term discharges to the Los Angeles River. In order to comply with this ARAR, any treated groundwater that will be discharged, on a short-term basis, to the Los Angeles River on-site must be treated to meet Federal MCLs or State MCLs for VOCs, whichever is more stringent.

The treated water will also contain nitrate. The Basin Plan states that the level of nitrate shall not exceed 45 mg/l in water designated for use as domestic or municipal supply. According to the Basin Plan, the Los Angeles River is not designated for municipal or domestic water supply. Therefore, the 45 mg/l is not an ARAR for the short-term discharges associated with the OU.

EPA has also considered what BAT could be for such short-term discharges. For on-site discharges, meeting the nitrate MCL through treatment by ion exchange would result in complex technical issues, such as disposal of waste brine, and would be very costly given the temporary nature of such discharges. Therefore, EPA has not identified ion exchange as the NPDES treatment standard for such short-term discharges.

EPA also considered the Mineral Quality Objective for the Los Angeles River of 36 mg/l (8 mg/l nitrate-N) established in the

Basin Plan. Because the anticipated average concentration of nitrate in the short-term discharge is likely to be close to the MCL, and any discharge would be short-term, there should not be any significant long-term effects on the mineral quality of the Los Angeles river associated with short-term discharges of VOC-treated water from the Glendale South OU.

It should also be noted that extractions of 2,000 gpm of groundwater per the Glendale South OU will result in decreased amounts of contaminated groundwater recharging to the Los Angeles River, thereby further protecting its beneficial uses.

Again, with respect to VOCs, any on-site discharge to the Los Angeles River must meet Federal MCLs or State MCLs for VOCs, whichever is more stringent. Since short-term discharges to the Los Angeles River would occur on-site, the procedural requirements for Federal National Pollution Discharge Elimination System (NPDES) as implemented in RWQCB Waste Discharge Requirements (WDRs) issued under Section 13263 of the California Water Code would not be ARARs.

10.3.3 Secondary Drinking Water Quality Standards

The State of California's Secondary Drinking Water Standards (SDWS) which are more stringent than the Federal Secondary Drinking Water Standards shall be ARARs for the Glendale South OU if the final use option involves serving treated groundwater as drinking water. 22 CCR §64471. The California SDWS are selected as ARARs because they are promulgated State standards and are relevant and appropriate to the action of supplying the treated water to a public water supplier. Although California SDWS are not applicable to non-public water system suppliers, the California SDWS are relevant and appropriate since the treated water under this action would be put into the City's drinking water system. Since the Federal SDWS are not enforceable limits and are intended as guidelines only, they are not ARARs for this action. Furthermore, since the State SDWS are more stringent than the Federal SDWS, EPA has not selected the Federal SDWS as requirements for this action. In summary, if the treated water is to be served as drinking water, the treated water prior to the point of delivery must meet the California SDWS. See Figure 10-1. If the treated water is recharged or discharged to the river, the water will not be required to meet State SDWS.

10.3.4 Resource Conservation and Recovery Act (RCRA) and Hazardous Solid Waste Amendment (HSWA) Standards, 42 U.S.C. §§6901-6987.

RCRA, passed by Congress in 1976 and amended by the Hazardous and Solid Waste Amendments of 1984, contains several provisions that are ARARs for the Glendale South OU. The State of California has been authorized to enforce its own hazardous waste regulations (California Hazardous Waste Control Act) in lieu of the Federal

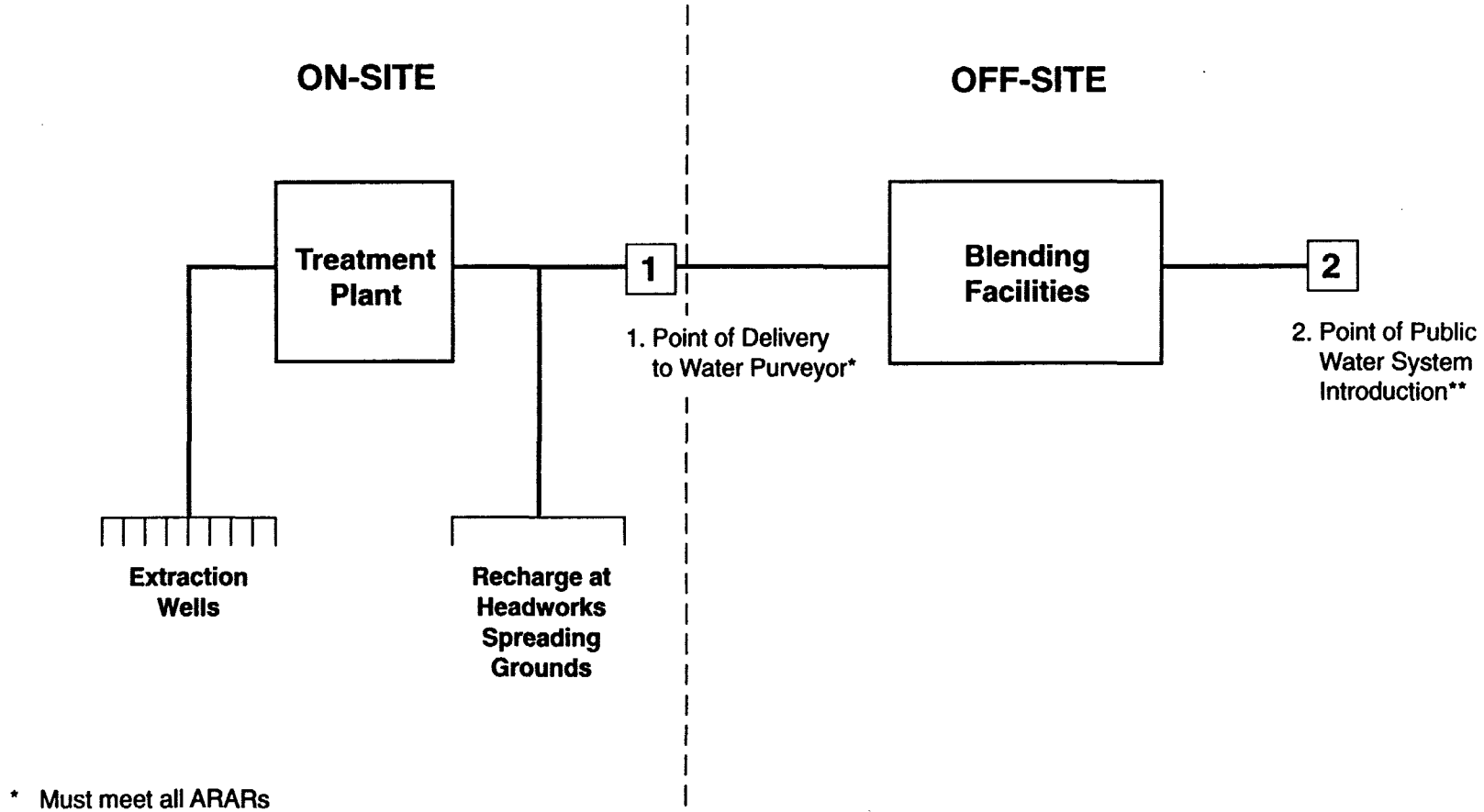


**FIGURE 10-1: ON-SITE ARARS AND OFF-SITE LEGAL REQUIREMENTS FOR THE GLENDALE SOUTH OU INTERIM REMEDY**

RCRA Program administered by the EPA. Therefore, State regulations in the California Code of Regulations (CCR), Title 22, Division 4.5, Environmental Health Standards for the management of Hazardous Wastes (hereinafter the State HWCL Regulations), are now cited as ARARs instead of the Federal RCRA Regulations.

Since the source of the contaminants in the groundwater is unclear, the contaminated groundwater is not a listed RCRA waste. However, the contaminants are sufficiently similar to RCRA wastes that EPA has determined that portions of the State's HWCL Regulations are relevant and appropriate. Specifically, the substantive requirements of the following general hazardous waste facility standards are relevant and appropriate to the VOC treatment plant for Alternatives 2 through 6: Section 66264.14 (security requirements), Section 66264.15 (location standards) and Section 66264.25 (precipitation standards).

In addition, the air stripper would qualify as a RCRA miscellaneous unit if the contaminated water constitutes RCRA hazardous waste. EPA has determined that the substantive requirements for miscellaneous units set forth in Sections 66264.601 -.603 and related substantive closure requirements set forth in 66264.111-.115 are relevant and appropriate for the air stripper. The miscellaneous unit and related closure requirements are relevant and appropriate because the water is similar to RCRA hazardous waste, the air stripper appears to qualify as a miscellaneous unit, and the air stripper should be designed, operated, maintained and closed in a manner that will ensure the protection of human health or the environment.

The land disposal restrictions (LDR), 22 CCR Section 66268 are relevant and appropriate to discharges of contaminated or treated groundwater to land. The remedial alternatives presented do not include land disposal of untreated groundwater. Because of the uncertainty in the levels of contamination and volumes of water to be derived from monitoring and extraction wells at this site, these waters must be treated to meet Federal and State MCLs for VOCs, whichever is more stringent, prior to discharge to land. By meeting the Federal and State MCLs for VOCs before spreading at the Headworks Spreading Grounds, Alternative 6 will satisfy the RCRA LDRs because the groundwater will no longer contain the listed wastes when it is recharged.

The container storage requirements in 22 CCR Sections 66264.170 -.178 are relevant and appropriate for the storage of contaminated groundwater over 90 days.

On-site storage or disposal of the spent carbon from the treatment system could trigger the State HWCL requirements for storage and disposal if the spent carbon contains sufficient quantities of hazardous constituents that cause the spent carbon to be classified as a characteristic hazardous waste. If the spent

carbon is determined to be a hazardous waste under HWCA, the requirements for handling such waste set forth in Sections 66262 and 66268 are applicable.

Certain other portions of the State's HWCL's regulations are considered to be relevant but not appropriate to the VOC treatment plant. EPA has determined that the substantive requirements of Section 66264.15 (general inspection requirements), Section 66264.15 (personnel training) and Sections 66264.30-66264.56 (Preparedness and Prevention and Contingency Plan and Emergency Procedures) are relevant but not appropriate requirements for this treatment system. EPA has made this determination because the treatment plant will be required to have health and safety plans and operation and maintenance plans under CERCLA that are substantively equivalent to the requirements of Sections 66264.15, 66264.30-66264.56.

## 10.4 Summary of ARARs for the Glendale South OU Interim Remedy

EPA has determined a number of chemical-, and action-specific ARARs for the Glendale South OU interim remedy. All of the alternatives that involve groundwater extraction and treatment could achieve the chemical-specific treatment standards for the groundwater at the point of delivery (see Figure 10-1). However, Alternative 3 which uses perozone is a less certain technology than air stripping or liquid-phase GAC adsorption for such a large volume of water and therefore is somewhat less likely to achieve the chemical-specific ARARs.

# 11.0 THE SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, EPA has determined that Alternative 2: Extraction, Treatment of VOCs by air stripping (either single- or dual-stage) or liquid phase GAC, Blending to meet the nitrate standard and Conveyance to a public water distribution system, in combination with Alternative 6 (as a contingency): Extraction, Treatment of VOCs, and Recharge at a Spreading Ground, is the most appropriate interim remedy for the Glendale South OU.

Alternative 2 includes the extraction of 2,000 gpm of contaminated groundwater for 12 years. The extraction wells will be new and will be located to inhibit most effectively the migration of the contaminant plume while maximizing the extraction of the most contaminated groundwater. The most contaminated groundwater is located in the upper or shallowest zone of the aquifer. Various locations and scenarios for extraction wells and rates of extraction are proposed in the FS report for the Glendale South OU; however, all design decisions for this interim remedy will be made during the remedial design phase. During the remedial design phase one of the locations proposed for extraction wells and

scenarios for rates of extraction per individual well may be selected or new ones may be selected.

The extracted groundwater will be filtered to remove any suspended solids, if necessary, and then treated for VOCs using dual-stage or single-stage air stripping with vapor-phase GAC adsorption for emissions control (liquid phase GAC may also be used). Whether air-stripping (dual versus single) or liquid phase GAC will be used will be determined during remedial design as will the exact location for the treatment plant. If air-stripping is used for VOC treatment, the air stream will be treated using a vapor-phase GAC adsorption system to ensure that air emissions meet Federal air quality standards as regulated by the South Coast Air Quality Management District and described in the ARARs section of this ROD.

After the extracted groundwater is treated for VOCs, the treated water exiting the treatment plant shall meet all MCLs and secondary drinking water standards with the exception of nitrate. The VOC-treated water will then be blended with water of such a quality that the treated, blended water will meet all drinking water standards (including the nitrate MCL). The treated and blended water to be delivered to a public drinking water supply shall meet all legal requirements. The water will then be conveyed to the City of Glendale and/or another municipality for distribution through the public water supply system.

As a result of comments by the City of Glendale on the Glendale North OU Proposed Plan (July 1992) and Glendale South OU Proposed Plan (September 1992) which indicated that the City had sufficient water credits to accept the treated water from both of these OUs, and in order to decrease overall costs associated with the OUs, EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined. The total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact configuration of the combined treatment plant will be determined during the remedial design phase of the project. The Glendale North OU Record of Decision also reflects this decision to combine the treatment plants.

However, if EPA determines that combining the treatment plants will significantly delay or hinder the implementation of the Glendale South OU, the treatment plants will not be combined.

EPA has selected Alternative 6, recharge of the treated water at the Headworks Spreading Ground, as a contingency if the City of Glendale or another San Fernando Valley water purveyor does not accept any or all of the treated water (possibly due to water supply needs). As a result, any remaining portion of water not accepted by the City of Glendale will be: first, offered to another San Fernando Valley water purveyor or, second, recharged into the

aquifer, per Alternative 6.

With the exception of blending to meet the nitrate MCL and final use of the treated water, Alternative 6 is identical to Alternative 2 above.

Under Alternative 6, after the extracted groundwater is treated for VOCs, the treated water exiting the treatment plant shall meet all MCLs for VOCs but will not need to meet secondary drinking water standards. The VOC-treated water will then be recharged into the aquifer at a Spreading Ground. To comply with ARARs, nitrate concentrations in the water to be recharged will have to be similar to or lower than the levels of nitrate in the area of the aquifer where the recharge will occur.

Groundwater monitoring wells shall be installed to evaluate the effectiveness of the Alternative 2 or 6 interim remedial action for the Glendale South OU. More specifically, groundwater monitoring will be conducted no less frequently than quarterly to: 1) evaluate influent and effluent water quality, 2) determine and evaluate the capture zone of the extraction wells, 3) evaluate the vertical and lateral (including downgradient) migration of contaminants, 4) to evaluate the effectiveness of the recharge well system and its impact on the remedy and 5) to monitor any other factors associated with the effectiveness of the interim remedy determined to be necessary during remedial design. Monitoring frequency may be decreased to less than quarterly if EPA determines that conditions warrant such a decrease.

The VOC treatment plant of the Glendale South OU interim remedy (whether it be Alternative 2, Alternative 6 or a combination thereof) shall be designed and operated so as to prevent the unknowing entry, and minimize the possible effect of unauthorized entry, of persons or livestock into the active portion of the facility. One means of preventing unauthorized entry would be to erect a perimeter fence around the VOC treatment plant. This fence should be in place prior to initiation of the remedial action and should remain in place throughout the duration of the remedy. The VOC treatment plant shall also be designed and operated so as to prevent releases of contaminated groundwater from the plant.

The selected remedy for the Glendale South OU meets all of EPA's nine evaluation criteria. The selected remedy is equally effective as the other alternatives in the short-term and long term reduction of risk to human health and the environment by removing contaminants from the upper zone of the aquifer, by inhibiting further downgradient and vertical migration of the contaminant plume, and by reducing the toxicity, mobility, and volume of contaminants in the aquifer.

The selected remedy is estimated to remove approximately 80% of the total estimated initial TCE mass after 12 years of

extraction. Thus, at the end of the 12 year interim remedy, a maximum TCE concentration of remaining in the upper zone of the aquifer would be approximately 10 ug/l. The selected remedy is estimated to significantly inhibit downgradient migration of contaminated groundwater as well as vertical migration from the upper to the lower zone of the aquifer. Furthermore, the modeling conducted as part of the FS indicated that the 2000 gpm extraction rate of the selected remedy would be effective in inhibiting the discharge of contaminated groundwater to the Los Angeles River by reducing groundwater levels to below river bottom elevations.

The VOC treatment technologies selected (dual- or single-stage air stripping with vapor phase GAC or liquid phase GAC) are technically feasible and proven effective at meeting ARARs for VOCs in the treated groundwater.

Alternative 2, in combination with Alternative 6, could be implemented, both technically and administratively.

In a letter dated May 28, 1993, the State agreed with EPA's selected remedy. EPA received several public comments during the public comment period, the majority of which expressed support for Alternative 2 primarily because Alternative 2 provides the treated water to a drinking water purveyor. These comments, along with EPA's responses are presented in Part III of this ROD, the Responsiveness Summary.

The selected remedy is protective of human health and the environment, meets ARARs, and unlike some other alternatives such as Alternative 4 which includes discharge of the treated water to the Los Angeles River, provides beneficial uses (distribution to a public water supply and/or recharge) for the treated water. The selected remedy is cost-effective. The estimated cost of Alternative 2 has a total present worth of $25,020,000, which is in the middle of the range for all six alternatives but this cost would be significantly reduced by combining the treatment plants for the two OUs (total cost savings of up to $13.8 million for both OUs). The estimated total cost of Alternative 6 is $22,420,000.

## 12.0 STATUTORY DETERMINATIONS

As required under Section 121 of CERCLA, the selected interim remedial action is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the interim remedial action, and is cost effective. The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment to reduce toxicity, mobility, and volume as a principal element.

The selected interim remedial action is protective of human health and the environment in that it removes significant VOC contaminant mass from the upper zones of the aquifer and inhibits further downgradient and vertical migration of contaminated groundwater.

The VOC treatment technologies selected (dual- or single-stage air stripping with vapor phase GAC or liquid phase GAC) are technically feasible and proven effective at meeting ARARs for VOCs in the treated groundwater and the air.

The selected remedy permanently and significantly reduces the toxicity, mobility, and volume of hazardous substances in the aquifer as well as the extracted groundwater.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, EPA shall conduct a review, pursuant to CERCLA Section 121, 42 U.S.C. Section 9621, at least once every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

## 13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The only significant change to the Glendale South OU interim remedy proposed in the Proposed Plan fact dated September 1992 involves the volume of water to be conveyed to the City of Glendale.

As a result of oral comments at the public meetings and written comments by the City of Glendale on the Glendale North OU Proposed Plan (July 1992) and Glendale South OU Proposed Plan (September 1992) which indicated that the City had sufficient water credits to accept the treated water from both the Glendale North and Glendale South OUs, and in order to decrease overall costs associated with the OUs, EPA has determined that the treatment plants for the Glendale North and Glendale South OUs will be combined. The total 5,000 gpm of treated water will be conveyed to the City of Glendale for distribution to its public water supply system. The exact configuration of the combined treatment plant will be determined during the remedial design phase of the project. The Glendale North OU Record of Decision will also reflect this decision to combine the treatment plants.

However, if EPA determines that combining the treatment plants will significantly delay or hinder the implementation of the Glendale South OU, the treatment plants will not be combined. Also, if the City of Glendale does not accept any or all of the treated water (possibly due to water supply needs), any remaining portion of water will be 1) offered to another San Fernando Valley water purveyor or 2) recharged into the aquifer.

The impact of this change is that the City of Glendale will be receiving 5,000 gpm of treated water. In its comments to EPA on both the Glendale North and South OU Proposed Plans, the City indicated that it would be able to accept the additional treated water. The cost of construction and operation and maintenance of the combined treatment plant is expected to be less than the cost of construction and operation and maintenance of individual treatment plants. Recent EPA cost estimates indicate that as much as $13,888,000 would be saved on the total present worth cost by combining the two treatment plants.

## PART III. RESPONSIVENESS SUMMARY

**For Public Comments received during the Public Comment Period for the Glendale South Operable Unit Interim Remedy at the San Fernando Valley Superfund Site Los Angeles County, California**

EXECUTIVE SUMMARY

This Responsiveness Summary addresses comments received from the public, State agencies, and local agencies on EPA's proposed interim cleanup plan for the Glendale South OU. Comments from the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) on the RI report for the Glendale Study Area, the Glendale South FS Report, and the draft Proposed Plan for the Glendale South OU were received by EPA prior to issuing the Proposed Plan and initiating the public comment period. DTSC's comments and EPA's responses are available for review in the Administrative Record for the Glendale South OU and are not included in this responsiveness summary.

EPA held a 107-day public comment period on the RI and FS reports, Proposed Plan and other Glendale South OU administrative record documents between October 5, 1992 and January 19, 1993. A public meeting was held in Glendale on October 21, 1992. Approximately 25 representatives of the community, local agencies, and EPA attended the meeting. EPA staff made a presentation on the Glendale South OU alternatives, including EPA's preferred alternative, and answered questions. A transcript of the meeting is included in the Administrative Record for the Glendale South OU.

EPA received comments orally from three members of the public during the October 21, 1992 public meeting.

EPA also received approximately 10 letters containing comments from interested community members, the City of Glendale, and the Los Angeles Department of Water and Power (LADWP). These letters are included in the Glendale South OU Administrative Record.

EPA received numerous comments from ITT General Controls, Inc. on several issues relating to the RI and FS documents and the Proposed Plan for the Glendale South OU interim remedy. Most of these comments criticized EPA for not justifying its decisions including its preferred alternative selection, suggested that EPA did not provide the proper supporting documentation and stated that the interim remedy for Glendale South OU did not demonstrate consistency with a permanent remedy for the San Fernando Valley sites. EPA responded that the Glendale South OU is an interim action and not a permanent remedy, that the RI/FS and remedy selection were conducted in accordance with the NCP, applicable EPA

guidance, that an entire Administrative Record with supporting documentation is available for review at the San Fernando Valley information repositories, and finally that the Glendale South OU interim remedy would not be inconsistent with nor preclude implementation of any final remedy for the San Fernando Valley sites.

The Responsiveness Summary is divided into two parts. Part I focuses on EPA's responses to the concerns and major issues raised by members of the local community including the City of Glendale. Part II includes detailed responses to the comments received (by ITT) that were more legal or technical in nature.